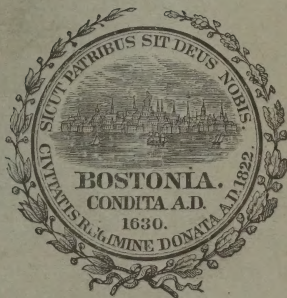


MEDICAL AND SURGICAL REPORTS
OF THE
BOSTON CITY HOSPITAL.

Second Series.



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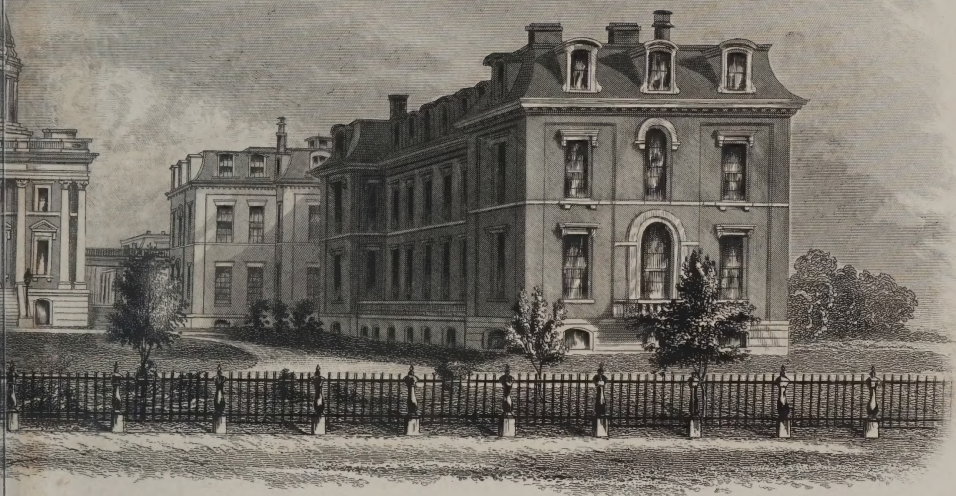
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W. F. Cooke, 1873

BOSTON CITY

Erected 1864.



HOSPITAL.

Enlarged 1876.

MEDICAL AND SURGICAL REPORTS

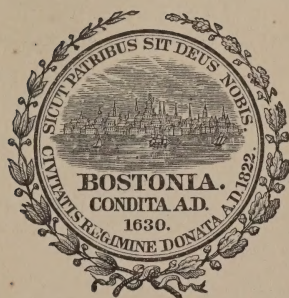
OF THE

BOSTON CITY HOSPITAL.

Second Series.

EDITED BY

DAVID W. CHEEVER, M. D., and F. W. DRAPER, M. D.



BOSTON:

PUBLISHED BY THE BOARD OF TRUSTEES.

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PREFACE.

The first Medical and Surgical Report of the Boston City Hospital embraced a period of five years; or, from its foundation, to June 1, 1869. The present volume includes the second five years of the hospital's existence, and extends to June 1, 1874. In its second half-decade the hospital has been enlarged and much improved. Meanwhile it has also suffered from losses by death in its Medical and Surgical Staff. Dr. Winslow Lewis, well known as one of our oldest surgeons, was thus removed from the Consulting Board; and, a little later, the Board was bereft of the mature experience of Dr. John Jeffries, by his lamented death. Dr. D. Mc B. Thaxter preserved his connection with the hospital, and struggled against his insidious disease, until the end of a laborious and useful life. In the death of Dr. Charles E. Buckingham, we mourn the loss of a strong mind and a tender, honest heart; he especially endeared himself to his younger medical brethren by his constant recognition of their wants, as a clinical teacher and as a consultant; he was ever thoughtful of their interests and careful to assert their rights; he wore himself out in his unselfish devotion to the sick, and died, prematurely for us, ripe in good acts if not in years.

It is hoped that the present Report, if less voluminous and statistical than its predecessor, may prove not less useful to the Medical Profession; and to them it is respectfully offered by

THE EDITORS.

212.103

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W. P. BOLLES, M. D.

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ERRATUM. On page 63, fifth line from the bottom, omit "antero-posterior."

EAST SPRING



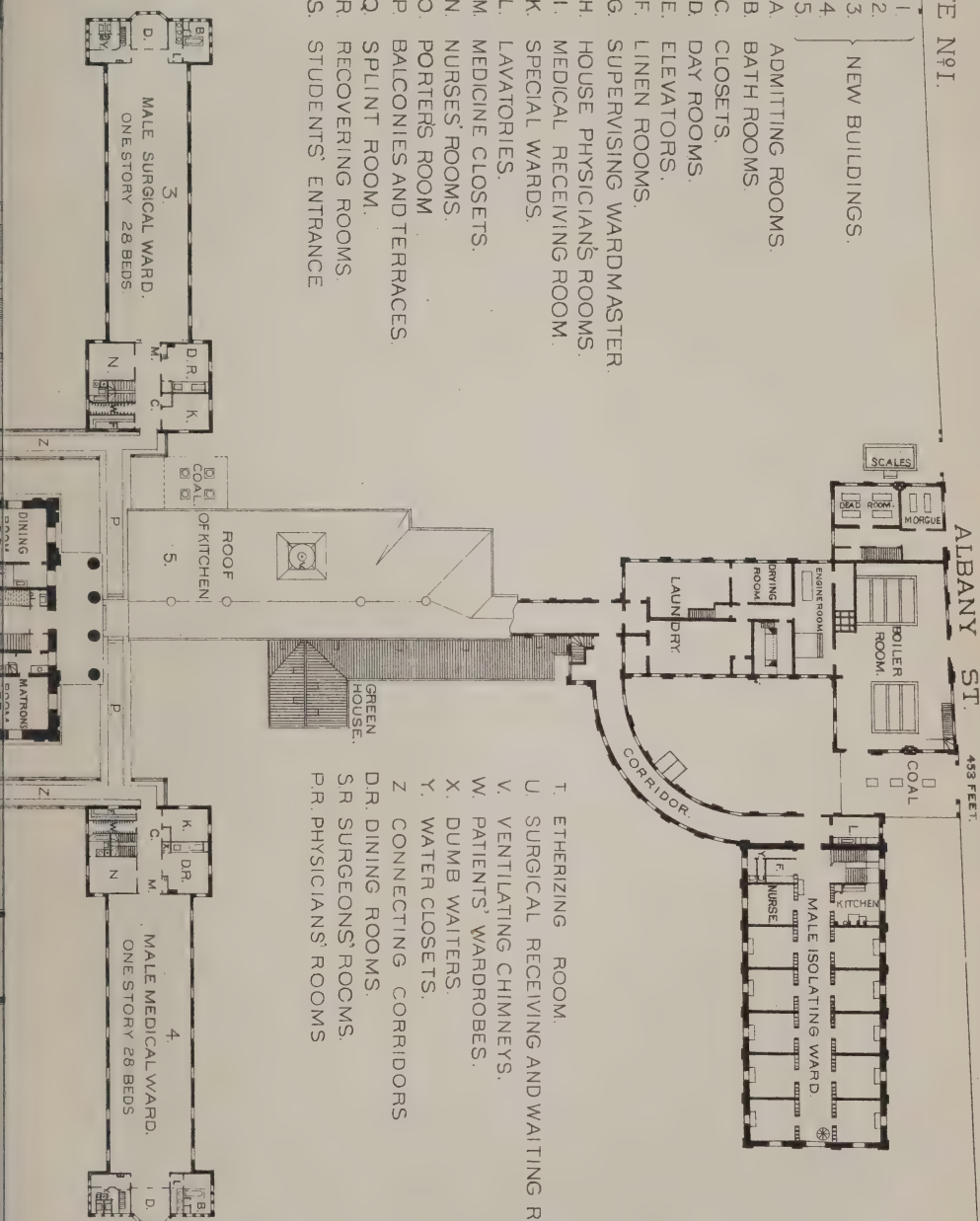
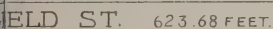
PLAN OF GROUNDS AND PRINCIPAL FLOOR

HARRISON AVENUE. 454-83 FEET.

J.H.Daniels Lith

S. STUDENTS' ENTRANCE

P.R. PHYSICIANS' ROOMS





DESCRIPTION OF THE HOSPITAL.

BY EDWARD COWLES, M. D.

The City Hospital was first occupied in the year 1864, fifteen years after the establishment of such an institution had been proposed in the project of continuing the Cholera Hospital at Fort Hill, in the year 1849. In 1857 the first decided action was taken by the city government, upon the urgent recommendation of Hon. Alexander H. Rice, then Mayor. This, however, accomplished but little more than the obtaining an act of the Legislature authorizing the establishment of "a hospital for the reception of persons who by misfortune or poverty may require relief during temporary sickness." In 1860 the City Council, responding to the appeal of the Mayor, Hon. F. W. Lincoln, Jr., definitely agreed to the project, and set apart from the city lands, on the South Bay territory, the present site of the hospital. During the next year plans were adopted, and the actual work of erecting buildings was begun.

The lot of land upon which the hospital stands is bounded northwesterly on Harrison avenue, 454.83 feet; southwest-erly on East Springfield street, 623.68 feet; southeasterly on Albany street, 453 feet; northeasterly on East Concord street, 660.27 feet; and contains in all about 292,000 square feet, or $6\frac{7}{10}$ acres. In addition, there was set apart a lot of land containing 69,318 square feet, in the rear of the hos-pital buildings, and east of Albany street, upon which were built a small-pox hospital, cholera wards, coal sheds, and a stable; but, excepting the latter, these buildings and the land were temporarily leased for other purposes in 1872.

The plans for the hospital were made by Mr. G. J. F. Bryant, architect, and were elaborated with much care, and

with the aid and counsel of physicians and others interested in its establishment. The hospital was one of the first built in this country upon the "pavilion plan," and was believed to contain all the modern improvements then accepted as essential in hospital construction.

It is well known that in the comparatively short period since the plans of this hospital were adopted, in 1861, very large experience has been gained in hospital construction in our own and in foreign countries, and very great and general interest has been excited in this and other sanitary questions. The experience of ten years here has pointed out some deficiencies and errors of construction in the original buildings of the hospital, and some very important alterations and improvements have been effected. In response also to the rapidly growing demand for increased accommodations, large additions have recently been made to the hospital. The object of this paper is to show what has been done here in improved hospital construction, and to set forth the reasons for the important changes and additions.

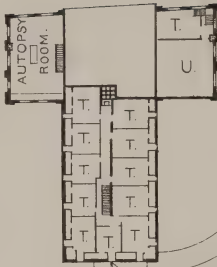
When substantially completed and occupied, in 1864, the hospital consisted of a central or administration building, two three-story pavilions and the necessary auxiliary buildings, — boiler-house, laundry, etc. To these there was added, in 1865, a two-story building for isolating wards. Subsequently a small building was erected, at the main entrance to the grounds, containing rooms for the out-patient department; and an enlargement was made of the boiler-house, with the addition of a dead-house, morgue, and autopsy-room. The buildings stood thus, with little material change, till 1875. Their general arrangement and the use of each are shown in Plate No. 1, excepting that the new buildings, numbered 1 to 5, have been recently erected, of which the first two occupy the places of the curved portions of the original connecting corridors. The principal alterations made in the older buildings were in their basements, for the improvement of their sanitary condition, and will be noticed in connection with the description of the new method of heating and ventilating. Other changes will be alluded to in the description of the buildings.



BASEMENT PLAN OF
SURGICAL BUILDING.

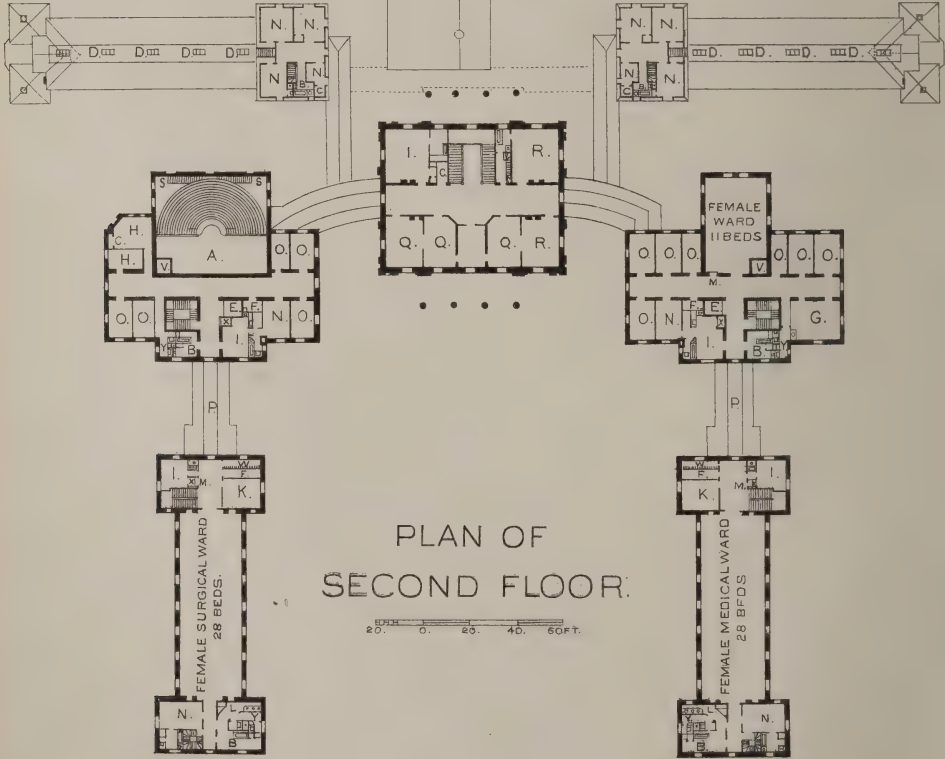
OUT PATIENT DEPT.

- 1. SURGEONS ROOM.
- 2. WAITING "
- 3. MEN'S "
- 4. DRESSING "
- 5. WOMEN'S "
- 6. DIET KITCHEN.



- A. OPERATING THEATRE FIRST FLOOR.
- D. OPENINGS FROM WARD TO
- V. VENT. CHAMBER.
- G. OPHTHALMIC OPERATING ROOM.
- H. HOUSE SURGEONS' ROOM.
- I. DINING ROOMS.
- O. PAYING PATIENTS' ROOMS.
- Q. OFFICERS' ROOMS.
- R. SUPT'S ROOMS.
- T. LAUNDRESSES ETC.
- U. CARPENTER'S SHOP.

FOR OTHER REFERENCES SEE PLATE 1.



PLAN OF
SECOND FLOOR.

20. 0. 40. 60 FT.

The administration building (Plates 1, 2, and 3) is 60 by 80 feet, and contains practically two stories, a basement and an attic; it is surmounted by a high dome, the apex of which is 148 feet above the level of the street. The building is of brick, upon granite basement walls, and finished inside with lathing and plaster. The basement rooms are 13 feet high, with floors $3\frac{1}{2}$ feet below the ground level, with an air-space, and concrete upon the earth underneath, and are used as dispensary, laboratory and store-room, dining-rooms for employes, and steward's office. The culinary work has been removed from the basement of this building to the new kitchen and bakery in the rear. The first and second stories, being respectively 16 feet and 14 feet high, are restored to the uses for which they were originally planned. On the first floor are the trustees' room, superintendent's office, room for the reception of visitors and for the library, matron's room and dining-room. On the second floor are the rooms occupied by the superintendent and his family, for officers, etc. The rooms on the third or attic story are lighted only from the ceiling, and are used as chambers for employes. The operating theatre in the dome, early found to be inadequate and difficult of access, is now disused. This building is connected with the others by corridors, open above and covered in below. The lower floors of the corridors, being $3\frac{1}{2}$ feet below the ground level, are at the general level of all the basement floors of the principal buildings, and the floors of the upper or open portion of the corridors are on a level with the first floors of the buildings.

The two pavilions, medical and surgical, are substantially alike in construction. They are 148 feet in length, 48 feet in width, three stories in height, besides the basements. The walls are of brick, upon granite base, and with lath and plaster finish inside. The basements, formerly occupied by patients, are now disused. On the first, second, and third floors are wards, each 80 feet long, and $27\frac{2}{3}$ feet wide, the two lower being each 16 feet, and the upper being 10 feet high. The first floors are about 6 feet above the general ground level. Each ward is lighted by 14 windows, 7 on

each side, and is arranged for 28 beds. At the entrance to the building on each floor (see Plates 1, 2, and 3) there are upon one side of the hall the patients' dining-room, medicine closet, dumb-waiter, etc., in place of what was originally the bath-room; and on the other side of the hall are a patients' wardrobe, linen-room, and room for special cases requiring removal from the ward, or for paying patients. The linen-room, and patients' wardrobe for clothing in daily use only, are both well-lighted rooms, and take the place of what was formerly the water-closets, and a dark closet for linen, etc., both without ventilation. A ventilating shaft adjoining the dining-room will independently ventilate all these rooms. The main stairway is also at this end of the building. At the farther end the nurses' room and a small stairway are on one side of the hall, as originally built; but on the other side the former arrangement of dining-room, closets for dishes, etc., is replaced by a comparatively isolated and independently ventilated apartment for the water-closets, slop-sink and urinals, and by a bath-room and lavatory. The doors of the two latter rooms close automatically by springs, and the bath-room and lavatory are separated only by a low screen, 7 feet high, so that air can pass freely through it, and light can enter over it, between the rooms and around the exterior of the inner apartment containing the water-closets. The door to the last-named apartment will also close automatically, swinging both ways. Thus will be prevented the danger of currents of air being induced through open doors from the water-closets to the ward. A special arrangement is made for independently ventilating the water-closet apartments by a shaft, 3 feet square, of wood lined with tin, which passes upward through them from the basement through the roof. The shaft contains within it the soil-pipe, hot-water pipes, steam-pipes for the supply of the steam-bath in the bath-rooms adjoining, and gas jets for lighting the water-closets, on each floor, through glazed windows in the sides of the shaft. The heat unavoidably radiated from these necessary appliances furnishes a continuous extracting force for the ventilating shaft at all seasons of the year.

The boiler-house and laundry, which are 300 feet from the administration building, and connected with it by a covered way, contain the boilers, the fan for forcing fresh air into the wards (but now disused), the engines, the laundry-machinery, and the washing, ironing and drying rooms. Over the laundry are a number of rooms for employes. In the year 1871 the boiler-room was enlarged, and adjoining it there were placed, on the ground floor, a dead-room and morgue, and on the second floor a commodious and conveniently arranged autopsy-room, with pathological cabinet, etc. Near the building a drive-way from Albany street was opened in 1874, and just within this entrance to the grounds large scales were placed for the weighing of coal and many other articles of hospital supplies.

A two-story brick pavilion, located near the southern corner of the grounds, contains the male and female isolating wards, which are shown in Plates 1 and 2. The building is $101\frac{1}{2}$ feet long, and $46\frac{1}{2}$ feet wide, with a basement or cellar underneath, which brings the first floor to a height of about 2 feet above the ground level. There is a ventilating chamber in the roof, 10 feet wide, extending the whole length of the building. A hall or passage-way, 10 feet wide, divides each story, with rooms on each side, and windows at each end, excepting at the entrance-door on the first floor. There are 10 rooms on each floor, 14 feet by 15 feet in size, and designed to accommodate one or two patients in each. Two additional rooms on each floor are for nurses, kitchen, bathing-room, etc.; and there are also water-closets and linen-rooms. The rooms on the first floor, for male patients, are 14 feet high; and those on the second floor, for females, are 18 feet high. Each room is surrounded by brick walls, upon which hard-finished plastering is laid. An important change made in this building, in the method of heating and supplying fresh air, will be noticed hereafter, in describing the general plan of heating and ventilating. The building is connected with the basements of the main buildings by a covered corridor.

The building for out-patients, added in 1867, is located

in the northern corner of the grounds, and at the main entrance to the hospital. It contains the porter's room, waiting and examining-room for applicants for admission, large waiting-rooms for out-patients, and physicians' rooms. Medical out-patients, and those having diseases of the eye, ear, skin, throat, and nervous system, and diseases of women, are treated here, the service being so arranged that each of the classes named receives attention on three days of each week, and on alternate days. The surgical out-patients were formerly treated in rooms in the basement of the surgical pavilion, but new accommodations have been provided for this department.

In 1874 a propagating-house was built along the southern side of the corridor in the rear of the administration building, and a gardener employed by the year to care and provide for the ornamentation of the grounds. The plan has resulted in a great saving from the previous expense for this purpose, besides the accumulation of a valuable stock of plants, etc. The heating of this greenhouse is done by a novel method and at a small cost: the water in the cast-iron pipes, circulating about the building in the usual way, is made hot in a common "feed-water heater" (such as is used by engineers for the saving of the heat of exhaust steam), in size 3 feet high by $1\frac{1}{2}$ feet in diameter, and requiring an inappreciable quantity of steam.

The hospital stood in 1874 substantially as first built, except the minor additions and alterations just described. As early as the year 1868 the hospital was felt to be crowded by the number of its patients, there being a daily average of 174 during the year, and the necessity of the enlargement of the hospital was represented by the trustees to the City Council. The rapid growth of the city and a greatly increasing demand for accommodations continued until, in 1874, the number of patients reached a daily average for the year of 230, and a maximum at one time of 285. The capacity of the hospital was at this time reckoned at 230 beds, including the occupation of 40 beds in the basements of the medical and surgical pavilions. The insufficiency and great inconvenience of the surgical operating

theatre in the dome had been early recognized. The great overcrowding of all the wards made the management and service of the hospital very difficult and laborious; and the impossibility of giving proper attention to sanitary requirements, and unavoidable neglect of needed repairs, were positively detrimental to the welfare of the sick.

In the beginning of the year 1874 decided steps were taken by the trustees for the enlargement of the hospital, and the City Council appropriated the sum of \$190,000 for the purpose. It was not easy to determine the best way in which the desired alterations and enlargement should be made. It was evidently necessary to revise the system of heating and ventilating, and to replace nearly the whole of the steam apparatus for that purpose; it was desirable that a large increase of capacity should be gained, and, at the same time, by a wise economy of expenditure, all essential modern improvements in hospital construction should be secured. While the simpler structures were believed to be the best, it was also demanded that the new buildings should conform architecturally to the older ones. Appreciating the value of the experience of the medical gentlemen long connected with the institution, the Board of Trustees first invited the medical and surgical staff of the hospital to present a general statement of what was needed to be done. Subsequently a committee of the Board of Trustees was appointed "to procure plans for the enlargement and additions to the present hospital buildings, in conformity to the needs therefor, as set forth in the communication of the medical and surgical staff." It was decided by the Board that while certain conditions should be fulfilled, as to the architectural appearance of the new buildings, it was also of the first importance to plan and adapt them in their relations to the older buildings, so as to gain both the best results for the sick and the greatest convenience and economy of administration. In accordance with their very considerate and liberal policy, the trustees determined that the plans should first be prepared in detail, at the hospital, under the supervision of those who were practically familiar with its needs. This was done chiefly under the direction

of one of the Committee on Plans, George W. Pope, Esq., well-known in Boston as a skilful practical builder, to whom the sketch-plans were frequently submitted during a period of several months, while being prepared by a draughtsman at the hospital, under instructions given him by the Superintendent.

The plans thus prepared were substantially carried out in all their details in the new buildings, and had the full approval of the hospital staff as being the best that could be devised to meet the many and conflicting indications presented in the attempt to engraft new features of construction upon older ones. These sketch-plans were afterwards placed in the hands of the architect, Mr. Carl Fehmer, of Boston, by whom the perfected plans and specifications were prepared, with some modifications only of the architectural exteriors, and with the details of construction. They were finally approved by the Committees on the City Hospital, and on Public Buildings, of the City Council, in March, 1875, and the work of building began in April of that year, reaching completion in the following year.

A plan of the principal floor of the new buildings is given in Plate No. 1. They are numbered from 1 to 5, and consist of a surgical and medical building, each three stories high, with basements; two one-story pavilions, surgical and medical; and a low building along the side of the rear corridor for kitchen, bakery, etc. These buildings are connected with the older ones by additions to the original corridors, and a part of the latter was removed to make room for the two larger buildings. The original plan of the hospital contemplated the erection of two additional pavilions in the rear of the first ones, to be connected in like manner, by corridors curved in reverse directions, with the administration building. The present arrangement of the buildings, as shown in Plate No. 1, is peculiar, and one that would hardly have been made under other circumstances; but it is found practically to have remarkable advantages in convenience, ease, and economy of management. In devising this arrangement, it was at the outset determined that as large an area of ground as possible should be reserved for

the present and future construction of one-story pavilions.* It was next agreed that the separate rooms to the limited number required for paying patients, and the smaller wards for children and for ophthalmic and gynecological patients, could be placed in buildings of more than one story. It was necessary, also, that one of the larger buildings should contain, on its first floor, the operating theatre, etc., for the surgical service, and should be conveniently located for easy communication with other buildings. Then it was made a matter of great importance that certain indications should be met as to the architectural appearance of the new buildings. The result obtained in this regard is well shown in the frontispiece, in which the surgical and medical buildings appear upon the right and left of the central or administration building. These locations were first chosen chiefly for convenience in administration, and to economize ground-space, but the arrangement was afterwards fully approved by the architect, the new buildings not being treated architecturally as wings of the central structure, but as separate members of the whole group, which, it is believed, has been greatly improved in appearance by the additions. The advantages of the separation of the pavilions are practically preserved by the distances left between the new and the older structures. The prevailing winds, in the warmer months, being from points between the west and south, readily traverse the spaces between the buildings as well as the buildings themselves, which, it is also to be noticed, approach each other by their ends, and thus admit of being more in proximity than otherwise. The corridors connecting the one-story buildings with the others offer little obstruction to the currents of air, being very open in their construction.

The surgical building is 48 feet by 94 feet in general dimensions, with a projection of 8 feet by 48 feet from the front wall, and another of 24 feet by 52 feet from the rear

* An acknowledgment is due to Frank H. Hamilton, M. D., of New York, for valuable advice given to the Committee of the Trustees and the writer, in the winter of 1875, as to the merits of such structures, and the importance of including them in the contemplated additions to the hospital.

wall. It is three stories high beside the basement; and the heights of the stories correspond with those of the older buildings, two of them being 16 feet, the upper one 10 feet, and the basement 9 feet. The foundations of the building are laid upon piling. The basement walls are granite, with faced brick inside, and the walls above are of brick, and 20 inches thick. All the walls are hollow, with a four-inch air-space, including the corridor walls, and all are plastered upon the brick, with all the corners of the rooms rounded. There is very little wood-work in the building, except the floors, and about the doors and windows, where it is very plain, being finished with a simple half-round moulding. The doors themselves have plain panels and bevelled stiles without mouldings, and all the wood-work is of clear white pine, filled with shellac and varnished. The base-boards are also bevelled at the top and joined to the hard-pine floors by a quarter circle in a strip of hard pine, and the floors are laid in $2\frac{1}{2}$ -inch strips, matched and blind-nailed. There are thus very few corners in which dust can collect, and the labor of preserving cleanliness is greatly reduced.

The main entrance to the principal floor of this building (Plate No. 1) is at its northern end, from which a corridor 8 feet wide extends through the length of the building, joined at its centre by another corridor which communicates with the open connecting corridor in front. At the right of the entrance is a private consulting-room, 11 feet by $15\frac{1}{2}$ feet, for the visiting surgeons, and a larger room for the office of the house surgeons, to which room are adjoined closets, etc. Next, along the corridor, is the main stairway, surrounded entirely by brick walls, and having double doors at the landing of each story, so arranged as to cut off currents of air from one story to another. Between the stairway and the front of the building is the room of the supervising ward-master, who has general supervision of all the surgical wards as to the reception and assignment of patients, the control of the male nurses, and the charge of the general business of the surgical service. Near the stairway, and in the opposite angle of the two corridors, is an elevator-

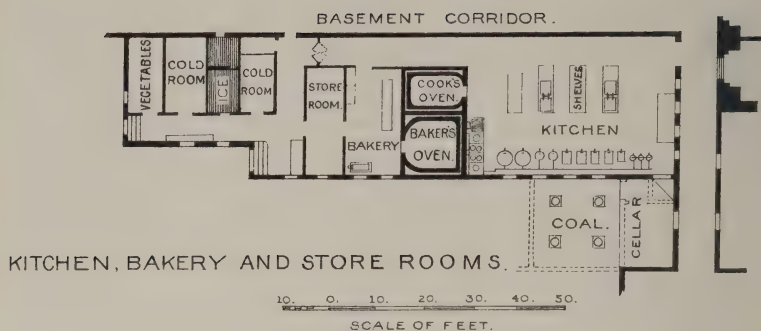
way, by which patients are to be carried to the upper stories of this building, and of the surgical pavilion in front of it, over the terrace of the connecting corridor, as shown in Plate No. 2. Beyond the elevator-way, and occupying the remainder of the front half of the first floor, are three waiting-rooms, in which male and female patients are separately placed before surgical operations. These rooms have water-closets, etc., adjoining two of them, and they serve also as small accident-wards, in connection with the accident-room, for severe cases received by night, or for such as cannot at once be placed in the common wards. On the opposite side of the corridor from the waiting-rooms, and quite isolated from the sight and hearing of their occupants, is the etherizing room. Adjoining this is the operating theatre, a large room about 49 feet by 42 feet in the clear, and 33 feet high, occupying two stories of the building. An enlarged plan and section of this room are shown in Plate No. 4. The arena is ample and roomy, being 17 feet wide from the corridor wall to the semi-circular seats which occupy the rest of the room, with a seating capacity of about 250 persons. A large skylight, 19 feet by 14 feet, gives abundant and satisfactory light. Operations requiring lateral light are done in the accident-room adjoining. Under the seats of the amphitheatre is considerable space occupied by a passageway, 6 feet wide, from which a few steps lead to the front row of seats, two recovery-rooms, a stairway from the students' entrance in the rear of the building, a splint-room, and a small bath and linen-room pertaining to the accident-room. The accident-room is situated immediately at the left of the main entrance to the building, and is large and well lighted, being about 19 feet by 22 feet; it communicates by a wide doorway with the operating theatre. These rooms are amply supplied with hot and cold water, and other conveniences. A large ventilating chimney is marked V, and is shown also in section in Plate No. 4, Fig. 1.

The second floor of the surgical building is shown in Plate No. 2, and on a larger scale in Plate No. 4. The rooms over the accident-room are occupied by the house surgeons, and those numbered 1 to 5 by patients. All the rooms

average in size $15\frac{1}{2}$ feet by $10\frac{1}{2}$ feet. Adjoining the nurse's room, occupied by the head-nurse of the ward and one assistant, is a bath-room, containing water-closet, etc. The dining-room is about 16 feet by 14 feet, and contains in one corner a soapstone sink, steam-table and shelves for crockery. A dumb waiter communicates with the diet kitchen in the basement. The bath-room has a bath-tub free from the wall on both sides, a sitz bath, hot and cold shower-bath, steam-bath and wash-bowl. The water-closet apartment is quite isolated by being shut off from the rest of the building behind the brick walls of the stairway, and is entered by a passage-way having two doors closing automatically, so that both shall not be open at the same time. This apartment contains two water-closets, a porcelain slop-sink and a urinal, and is ventilated independently of all other rooms by a special arrangement shown in Plate No. 4, Figs. 1 and 3. A tin-lined shaft, 2 feet square, contains within itself the soil-pipe, hot-water and steam-pipes in constant use, and gas jets on each floor to give light through small windows in the sides of the shaft. The ventilation is efficient at all times. The soil-pipe passes upward above the roof, and is open at its top. A side of the shaft can be easily removed at any time for inspecting or repairing the pipes. All sinks, wash-bowls, etc., are supported on brackets, and the space underneath left open, with the plumbing work exposed. A number of Jennings' all-earthenware water-closets are in very successful use; these are also left exposed under the seats, which have no risers, thus securing great advantage as to cleanliness. The description here given of the service-rooms applies also to the other upper stories of this and the medical building. The upper floor of this building (Plate No. 3) differs from the one just described in having three small wards for children, one for ten beds, about 49 feet by 15 feet, and two for four beds each, about 18 feet by 14 feet. The basement plan of the surgical building is shown in Plate No. 2, where the use of the rooms numbered from 1 to 5, for surgical out-patients, is indicated. The dressing-room is supplied with appliances, splints, etc.; and adjoining these rooms are separate water-closets for each sex. Patients

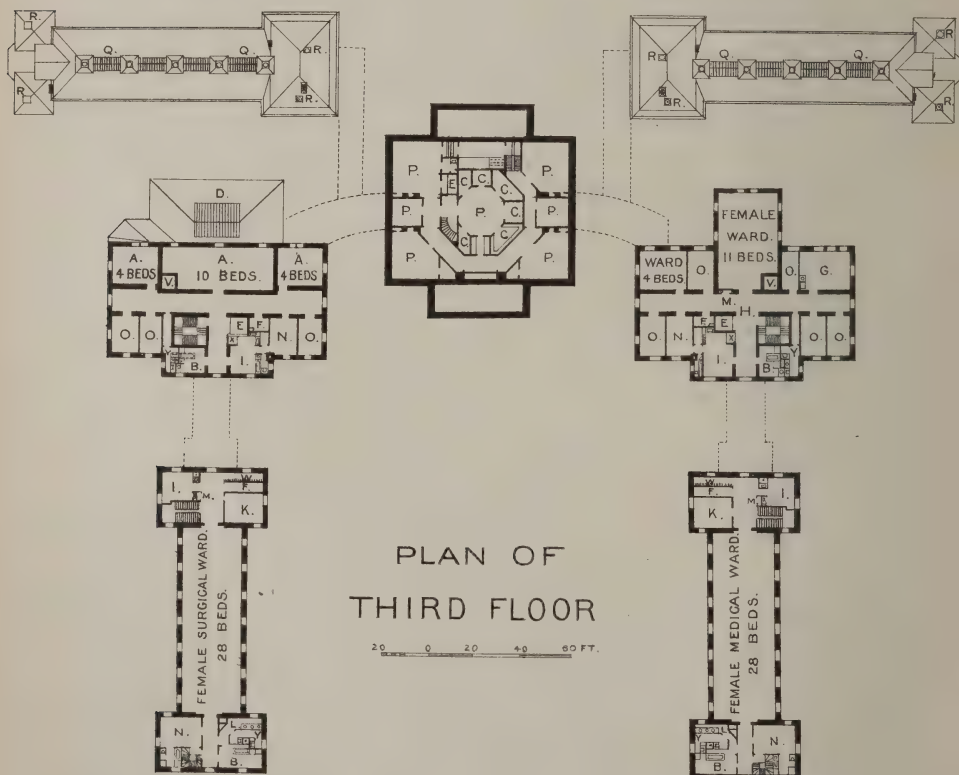
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PLATE N^o 3.



- | | |
|--|---------------------------------|
| A CHILDREN'S WARDS. | O PAYING PATIENTS' ROOM. |
| D SKYLIGHT OVER OPERATING THEATRE. | P CHAMBERS. |
| G OPERATING ROOM. | Q GLAZED ROOF OF VENT. CHAMBER. |
| H WARDS AND ROOMS FOR DISEASES OF WOMEN. | R VENTILATORS. |

FOR OTHER REFERENCES SEE PLATE N^o 1.



requiring other than minor operations or treatment in the wards are sent to the surgical rooms above, on the first floor. The diet-kitchen (room No. 6) has a cook in attendance for the preparation of special diets for all the surgical wards. The basement floors are all made hard with concrete and cement, upon which hard-pine flooring is laid, excepting in the diet kitchen, where there is a flagging-stone and brick paving. The walls of these rooms are finished by simply painting the faced brick a light color.

The medical building (numbered 2 in Plate No. 1) is symmetrical in general appearance and dimensions with the one just described, except that the projection in its rear is 30 feet by 24 feet. A small ward of eleven beds is thus formed on each of the three stories, in size about $26\frac{1}{2}$ by $40\frac{1}{2}$ feet. The ward on the first floor is designed for male ophthalmic patients, and contains all the sick who are treated on this floor. Near the main entrance are the offices of the visiting and house physicians. On the opposite side of the corridor is a receiving-room for medical cases, and adjoining it the room of the supervising ward-master of the medical service. Three rooms, marked H in the plan, are occupied by the house physicians. The bath-room for patients on this floor is placed near the ward, but otherwise all the service-rooms of this building are like those in the one previously described. A medicine closet, 20 inches deep, occupies the thickness of the corridor wall near the entrance to the ward on each floor. This closet is furnished with a marble slab, small wash-bowl, hot and cold water, shelving, and gas-light. It is very convenient, and having glass doors, is constantly under inspection, and easily kept in a cleanly and tidy condition. The second floor (Plate No. 2) has seven rooms, each averaging $16\frac{1}{2}$ feet by 11 feet, for paying patients of the medical and ophthalmic service. For free patients of the latter class the ward is designed. A large room, G, is for an ophthalmic operating room, but available also as a small ward. The third floor (Plate No. 3) is devoted entirely to the treatment of diseases peculiar to women. There are five rooms for paying patients, and a small ward, of four beds, besides the larger ward containing eleven beds. An operat-

ing-room, at the southern corner of the building, is light and capacious, and, with low window-sills, abundant lateral light is obtained. In the basement of this building is a kitchen for preparing special diets for the medical wards, a room, with a chimney for ventilation, etc., for a laboratory, where the chemical and microscopical examinations may be made, a general linen-room, and a sleeping-room for male nurses. These rooms are finished in the same manner as those in the basement of the surgical building. The water-closet apartments of this building also have a special ventilating shaft, as already described, and the bath-rooms adjoining the nurses' rooms in each building are ventilated by a chimney warmed by the copper smoke-flue of the range in the basement diet-kitchen.

The one-story buildings are shown in plan, in Plate No. 1, where they are numbered 3 and 4; and a section and elevation of the surgical pavilion are shown in Plate No. 5. The two buildings are alike in form and arrangement. The underpinning is laid upon a foundation of concrete with no piling. The framing is wood and iron, with a covering of boards and, outside of this, corrugated iron. The roof is slated; the inside of the building has a lath and plaster finish, and the wood-work is very plain, as described in the surgical building. The general dimensions are 137 feet by $40\frac{2}{3}$ feet, except that the portion of the building occupied by the ward is narrowed to 28 feet, so that the ward is 94 feet by $26\frac{1}{3}$ feet in the clear. The entrance to the building is from the connecting corridor. The hall, 8 feet wide, has, upon the right-hand side, a small special ward or examining room, 15 feet by 11 feet, a drying closet, a medicine closet, and the dining-room, 15 feet by 17 feet, furnished with a soap-stone sink, steam-table, shelving, small broom-closet, and a dumb-waiter by which food is sent from the corridor basement. On the left of the entrance is a linen-room, and a room for patients' clothing in daily use, other clothing being kept in an appropriate place in the basement. The last-named rooms are each 4 feet by 15 feet, and each is lighted by a window. The patients' wardrobe has along its sides twenty-eight small stalls, numbered to correspond with

the beds in the ward. Every article of a patient's clothing as soon as taken off is hung in its proper place in this room. The room for the head-nurse and her assistant is 12 feet by 15 feet, and has a bath-room, etc., adjoining. These service-rooms are 14 feet high to the ceiling, and over them, in this part of the building only, is a second story, reached by a narrow stairway with a door at its foot, where there are four rooms for nurses, and a common bath-room. There is an arrangement for ventilating the water-closets and clothing rooms by an independent shaft enclosing the soil-pipe, etc., as already described.

The ward is 94 feet long by $26\frac{1}{3}$ feet wide in the clear, and has 7 opposite windows and 14 beds on each side. The windows, having double sashes, are 9 feet high by 4 feet wide, and the space between them is nearly $9\frac{1}{2}$ feet. The height of the ward, from the floor to the centre of the arched ceiling, is 22 feet, or an average of about 19 feet. Each bed occupies about $6\frac{3}{4}$ feet along the wall, and $13\frac{1}{6}$ feet to the centre of the ward. Thus a floor area of 89 square feet and an air-space of about 1,700 cubic feet is given to each bed.

At the end of the ward is a day-room, 11 feet by 12 feet, lighted by a bay-window. Wide glass doors open into this room from the ward, and in the end wall over these doors there are windows, thus giving the end of the large room a light and open appearance. These arrangements are shown in Plate No. 5, Figs. 1, 2, 3 and 5. On the right of the day-room is the lavatory, a narrow room with a window, marble slab and wash-bowls. In a separate room adjoining, with doors so arranged that entrance is easy for carrying in a patient on a stretcher, is the bath-room, 9 feet by 13 feet, furnished like the bath-rooms before described. At the opposite corner of the building is the room for water-closets, etc. The entrance from the ward opens by a self-closing door, first into a lobby $3\frac{1}{2}$ feet wide, with a window at each end. In one section of the lobby is a narrow stairway, for occasional use, leading to the basement. A low partition and lattice door shuts off this section, but does not obstruct the passage of air from one window to the other. From the

lobby a self-closing door opens into the water-closet apartment, the arrangement of which is shown in the plan (Plate No. 5). A section of the ventilating shaft for the water-closets is shown in Fig. 4. A steam-pipe heats the shaft, aided by a gas-jet, which lights the room by night. Fresh air is supplied to this room by an independent inlet, and the lobby also has separate air-supply and ventilation. All the spaces under the sinks, washbowls, seats of water-closets, etc., are left open, and the plumbing is exposed to view.

The basement, excepting of that part of the building occupied by the service-rooms at its entrance, is an open and free air-space, containing only heating apparatus. The floor is made hard and impenetrable to moisture by concrete and cement, and is on a level with the ground outside. Its numerous windows can be left open many months in the year, and, its doors being locked, it is kept cleanly and free from any intrusion but for proper purposes.

The main kitchen of the hospital was formerly under the administration building, and there was great deficiency of space, storage-rooms and proper ventilation. The place of the new kitchen is shown in Plate No. 1, and a plan of it is given in Plate No. 3. Its general dimensions are 45 feet by 30 feet, and it connects with the basement corridors. It is about 10 feet high in the clear, and its roof is nearly on a level with the first floor of the other buildings, so that the winds pass freely over it and between the other buildings. It has brick walls, which are painted inside, and a solid floor of slate tiles and bricks laid in cement. It is well-furnished with a Whiteley's range and steam-jacket kettles for cooking meats, soup and vegetables; a large tea and coffee apparatus; iron sinks; shelves for utensils upon a movable table, and a brick oven for roasting meats, etc. All the furnishing of the kitchen, except the range, stands away from the wall. The plan shows the arrangement of the bakery, store-rooms for flour and bread, the refrigerator and store-rooms for meats, vegetables, etc. A small cellar and coal-bin, underground, is connected with the kitchen. A large chimney, with the smoke-flue inside of it, over the ovens, ventilates the heated space over them and the kitchen and bakery. Openings are

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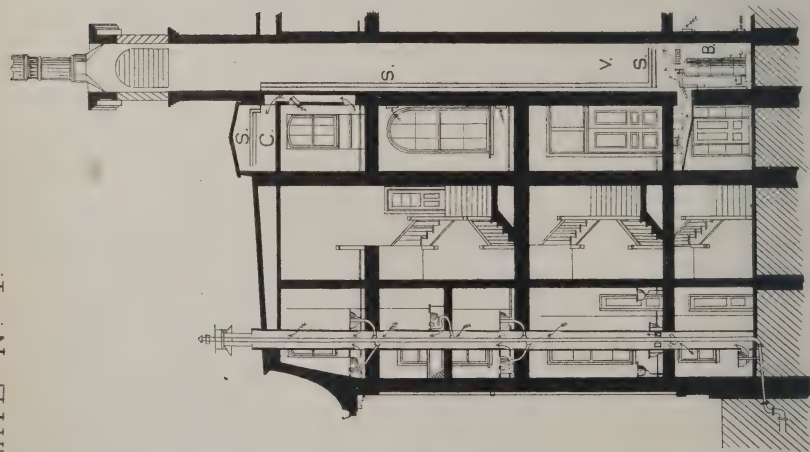


FIG. 1. SECTION ON LINE E---F.

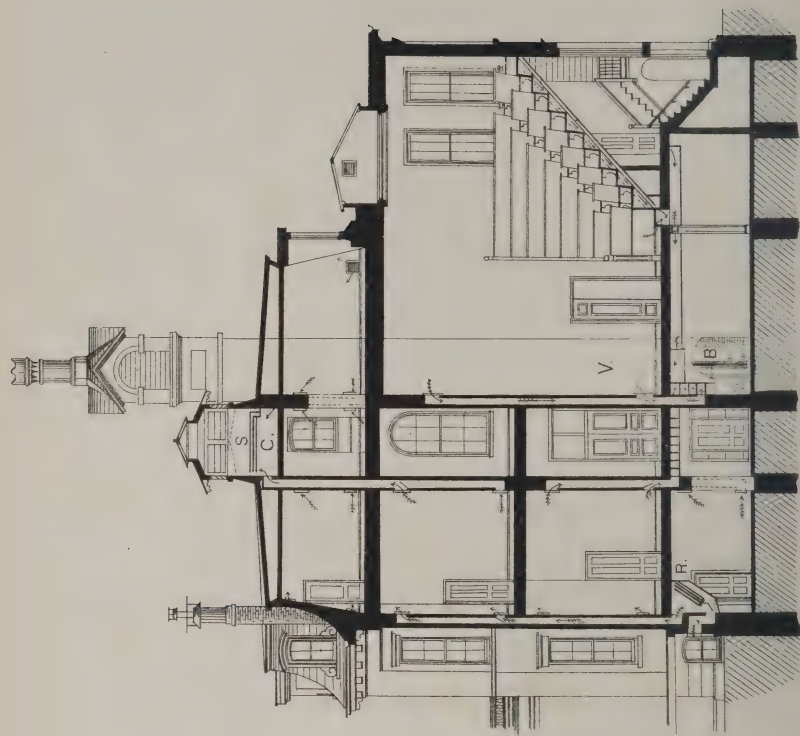


FIG. 2. SECTION ON LINE O---P.

PLANS SHOWING

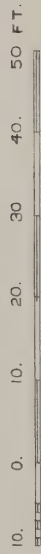


FIG. 3. PLAN OF SECOND FLOOR.

left in the brick walls outside, near the eaves, so that air can enter the space between the ceiling and the roof, from which it escapes through ventilators, thus cooling the roof and the rooms below in hot weather. The kitchen is centrally located, and the food is conveniently distributed in covered cars to the various buildings.

HEATING AND VENTILATING.

The boiler-room (Plate No. 1) contains seven steam-boilers. The four older ones are each 16 feet long by 48 inches in diameter, with forty tubes, each 15 feet by $3\frac{1}{2}$ inches. The three new boilers are each 15 feet by 48 inches, with forty-nine tubes, 14 feet by 3 inches. The method by which the hospital was formerly heated and ventilated was as follows : *—

"Air forced through ducts, by means of a large fan at the boiler-house, and warmed by coils of steam-pipes placed in these ducts, is carried to every part of the buildings, thus affording the means of heating as well as ventilation. Direct radiation is provided for in a portion of the rooms, to be used in case of necessity. The steam-pipes over which the air passes for heating the different apartments in the central buildings are placed in coils, in chambers connected with the air-ducts. Those for heating the pavilions are located in the air-passages, beneath the floor under the corridors leading to the pavilions. The passage through which the air passes, after having left the main duct on its way to the pavilions, is divided into two compartments, in one of which is located coils of one-inch wrought-iron pipe. The steam, after passing from the boilers in a large iron pipe, is distributed through these coils, being regulated by valves, under charge of the engineer. After passing through the coils, it enters a steam-trap, located at the foot of the coil, which is so constructed that no steam can pass, where, after being converted into water, it is conveyed through a cast-iron pipe to a reservoir, located at the head of the air-duct ; from thence it

* City Hospital Reports, First Series, page 17.

is pumped into the boilers, at a temperature of from one hundred and eighty to one hundred and ninety degrees. Through the other compartment cold air passes. These two compartments are so arranged that the cold and warm air are brought together in the several wards, where they come in contact before entering the room."

The cemented floor of the air-duct here described as passing under the corridor basement-floors, was about $3\frac{1}{2}$ feet below the latter, and thus about 7 feet below the ground level. Because of certain faults of arrangement, and in consequence of troubles to be hereafter described, arising from the location of the air-duct at such a depth, this system of heating and ventilation by impulsion was entirely abandoned in 1875, and the method by aspiration was adopted. The steam-radiators in the various parts of the buildings being raised to the basement ceilings, and the floor of the boiler-room being lowered six feet, the boilers, with the three new ones added to their number, could thus receive the water of the condensed steam flowing back into them without the intervention of a tank and pump, involving much loss of heat. In this manner the four older boilers have, at the date of this writing, been applied for one whole year to the warming of the main buildings of the hospital, excepting the isolating wards. This has ordinarily been done in cold weather by three boilers at low pressure of steam, rarely as high as 5 lbs., and with the index of the pressure gauge standing for days at zero. In extreme weather, the fourth boiler was put at work on a few occasions. The average daily consumption of coal in these boilers was from 3,000 to 3,500 lbs. per boiler, never over 4,000 lbs. in very cold weather. The three new boilers have been applied at high pressure (15 lbs. to 30 lbs.) to running the laundry machinery, cooking, heating water for all purposes in all the buildings, heating ventiducts of water-closets, the ventilating chambers in the roofs of the medical and surgical buildings, and in the ridges of the one-story pavilions, besides warming the two isolating wards. With these boilers, the use of the tank and pump has been necessary, and two of them have done all the work, except in extreme weather,

consuming daily per boiler but little more coal than the low-pressure boilers. Any one or more of the boilers can be used at high or low pressure.

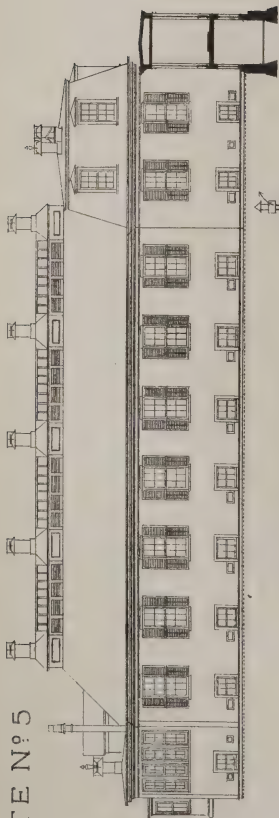
The steam is conveyed to the different buildings in large pipes, the main pipe from the boilers to the administration building being eight inches in diameter. The distribution of the heating apparatus, the method of furnishing the fresh-air supply and of ventilating are shown in the plans in Plate No. 4. In Fig. 1, a section of a part of the surgical building, is shown the arrangement and special ventilation of the water-closets already described, the motive aspirating power in the shaft being furnished by steam-pipes, hot-water pipes and the gas-jets in daily use. The manner of covering the soil-pipe, imbedded in cement, to its exit through the foundation of the building to join the drain outside is here shown.

The aspirating chimney of this building, shown in Figs. 1, 2 and 3, is 6 feet square inside, and about 70 feet high from the basement floor to the bottom of the openings in its sides near its top. It was first proposed to place the boilers for heating all the surgical wards in the basement of this building, and to make a similar arrangement for the medical wards also, the smoke-flue to stand within the chimney, and thus furnish motive-power for ventilation; but the plan of concentrating the boilers in the present boiler-room being continued, heat is furnished to the chimney by utilizing the unavoidable radiation from the bath-boiler placed conveniently at its base. The additional steam-pipes to increase the aspirating power of the chimney, shown in Fig. 1, have not yet been found necessary, and there is always found a positive upward current of air. It is believed that decided advantages are gained from the somewhat novel plan of managing the ventilation of these new three-story buildings. The chimney is used only to ventilate the rooms of the basement and first floor; the warm and vitiated air from them, being conveyed laterally, or only a little downward, to the base of the chimney, is practically kept on its way upward and outward. The two upper stories are ventilated by a different plan, their outflowing air being simply aided in its

upward tendency by being drawn into the chamber in the roof (Figs. 1, 2). There is thus no loss of power in first drawing the air downward to the chimney base; there is no danger of the common trouble in such cases of reversed currents of foul air from the first to the upper stories through the ventilating flues of the latter. All communication is thus very perfectly cut off between the lower and the upper stories. The ventilating chamber in the roof can be warmed by steam-pipes, which have been employed only in damp or still warm weather. The air escapes through the sides of the chamber, which receives additional warmth in sunny days through its glazed roof.

Each room in the building has one or more separate ventilating flues, extending from floor to ceiling in the wall next the corridor, and each flue has two openings into it, and within it a valve, so arranged that it can only be moved by a key. The entrance to the flue is thus practically always open either at the top or bottom of the room. Thus all the upper outlets can be closed, compelling ventilation through the lower openings during the winter season, with the certainty of remaining so at the will of the superintendent, and beyond the reach and interference of unwise attendants or meddlesome patients. In the same manner, by simply turning the valves, the ventilation can be made to proceed through the upper openings in summer. It is to be noticed that the air passes downward from the rooms on the first floor, and upward from the upper stories.

Each small room has one, and the larger rooms have several inlet flues in the outer wall of the building for supplying fresh air, also arranged with valves so that the fresh air must enter in a given volume either at the bottom or the top of the room at will. This is illustrated in Fig. 1, in the room on the second floor. The cold air is introduced through openings in the outer basement-walls, passes immediately over the steam coils, of which there is a separate one for every flue, and upward to the rooms, which it enters through the lower or upper register, according to the adjustment of the valve. The most satisfactory method for the winter season has been to introduce fresh air by the upper registers,



SIDE ELEVATION
FIG. 1.



FIG. 2 REAR.



FIG. 3.

PLAN OF BATH ROOM AND W.CLOSETS.

10. 0. 10. 20. 30. FT.

DOORS TO
DAY ROOM.
LAVATORY.
CASING OF
RADIATOR.
STEAM PIPES.

G. L. R. S.

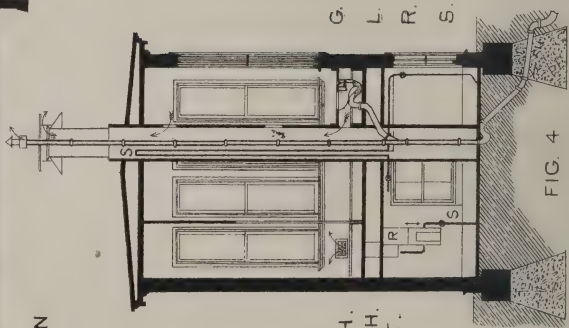
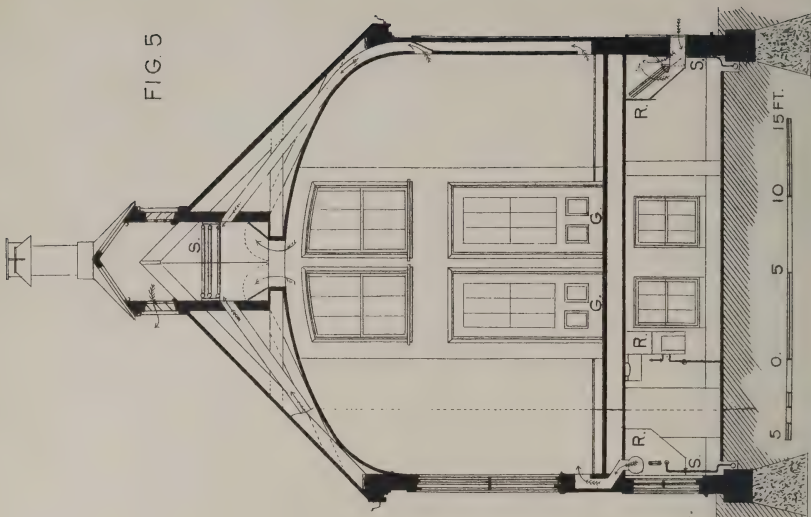


FIG. 4

SECTION ON LINE A. B.
VENT. OF W. CLOSETS.

FIG 5



PARTIAL SECTION.
THROUGH WINDOW.

PARTIAL TRANSVERSE
SECTION BETWEEN WINDOWS.
DETAIL OF HEATING AND VENTILATING.

and extract foul air by the lower ones. In summer the reverse arrangement is the best.

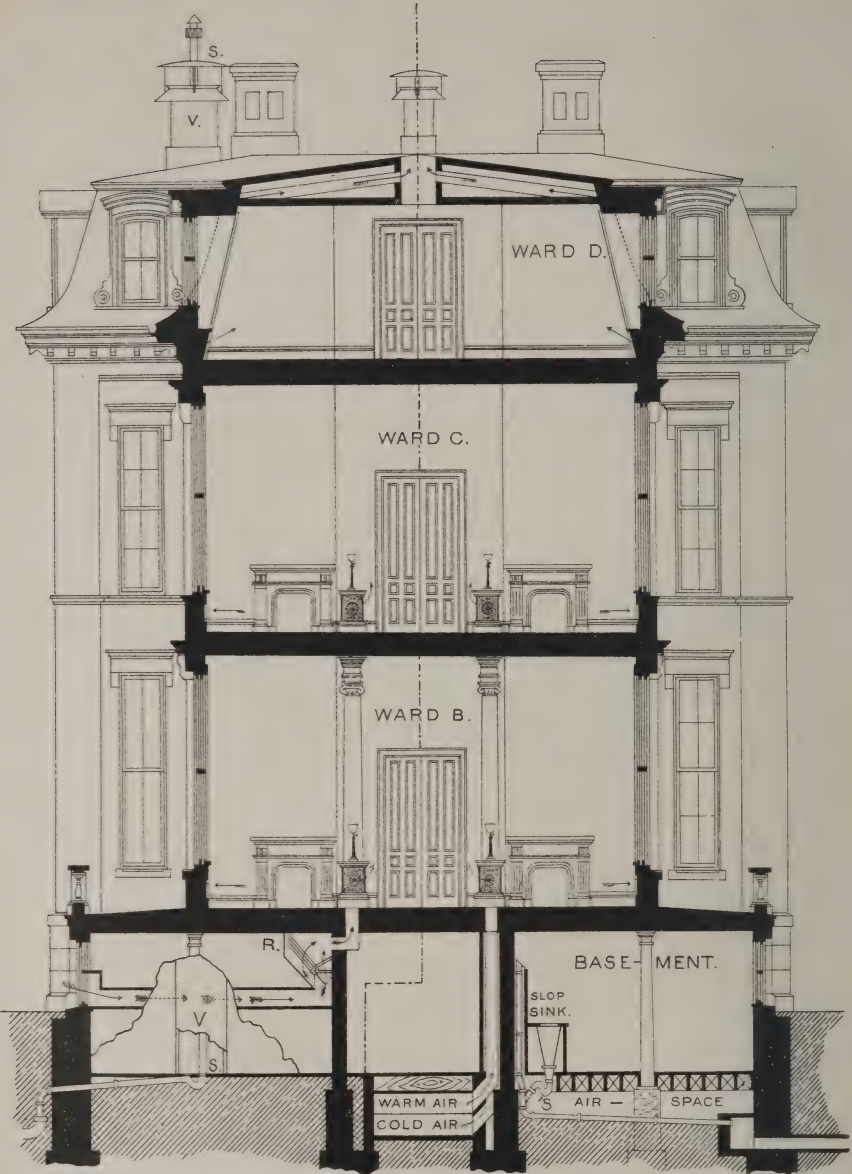
The steam-radiators in the basements are encased with galvanized iron, forming a small chamber in which a switch-valve directs the fresh air, so that it passes either through the coil so as to be warmed, or, unwarmed, directly into the flue above. A wire connects the switch-valve with the lower register in the room above, where by the use of a key the valve can be adjusted to alter the temperature of the entering air. The volume of air can only be changed by opening or closing a sliding valve covering the inlet through the basement wall, and this is under the charge of the engineer. The arrangement of the apparatus for introducing, heating and controlling the fresh-air supply is more plainly shown in Plate No. 5, Fig. 5.

In the plan of the second floor of the surgical building (Plate No. 4, Fig. 3), the fresh-air inlets and outlets are shown. Some observations made in these rooms, to test the efficiency of the ventilation, have given satisfactory results. In the room numbered 3, where there are about 2,600 cubic feet of air space, and the inlets and outlets have each one square foot of clear openings, the velocity of inflowing and outflowing air, as shown by the air-meter, averaged in a number of observations 150 feet per minute. At this rate, 9,000 cubic feet of air pass through the room, changing its contents between three and four times per hour. The atmosphere out of doors, at the time of the observations, was clear, and quite still, the temperature about 30° F., that of the room 68° F.; and there was no artificial heat in the ventilating chamber in the roof. With added heat by the steam-pipes in this chamber, its aspirating power is increased, and good ventilation can be obtained at all times.

The plan (Plate No. 4, Fig. 3) shows the first floor of the operating theatre, the room being two stories high. The shaded lines and arrows indicate the downward and lateral direction of the foul air, under the floor, to the base of the large chimney, from the ventilators in the corridor-wall and in the risers of the steps leading up to the seats of the amphitheatre. The amphitheatre is capable of seating 250

persons, though the number likely to be present will rarely exceed 200. The room contains 55,000 cubic feet of air-space, and its atmosphere is easily changed between two and three times per hour, with ventilating outlets equal to 12 square feet of clear opening, and a usual outflow velocity of not less than 200 feet per minute. It is safe to say that more than 700 cubic feet of air per hour is supplied to each person. The efficiency of the ventilation is well indicated by the notable absence of the odor of ether in the theatre during operations, while at the same time that odor is very strong within the base of the chimney. Observations made almost daily, during the last year, of the working of the chimney, prove its up-cast draught to be continuous, and without any added heat from the available steam-pipes. The total cubic space ventilated by the chimney in the surgical building equals about 88,000 cubic feet; the area of the chimney is 36 square feet, and the air-meter indicates that a velocity of outflow of at least five feet per second may be constant. The motive-power producing this result is simply the waste-heat unavoidably radiated from the upright bath-boiler standing in the base of the chimney. The velocity mentioned is considerably less than the theoretical velocity of such a chimney, but the means are provided for easily increasing and insuring the constancy of its aspirating power.

The method of heating and ventilating the one-story buildings is shown in Plate No. 5, Fig. 5. The arrangement for introducing and controlling the quantity and temperature of the fresh air has already been described. The engineer alone has access to the basement, and the sole charge of the adjustment of the valves controlling the volume of inflowing air. The air enters the wards only through inlets under each window, 14 in all, each inlet equal to $1\frac{1}{4}$ square feet of clear opening. The foul air escapes through five large openings along the centre of the arched ceiling, each 3 feet by 6 feet, into the ridge-chamber, and thence either through the free openings in the sides of the chamber above the roof, or through five ventilators, each 2 feet in diameter, on the top of the ridge. The side openings are closed in winter,



PARTIAL SECTION —
NEW METHOD.

PARTIAL SECTION —
OLD METHOD.

5 0 5 10 15 20 25 30 35 FT.

SECTION OF 3 STORY PAVILION.
SHOWING ALTERATIONS OF BASEMENTS AND FRESH AIR SUPPLY, ETC.

- | | |
|-----------------|-------------------------------|
| B. BRICK DRAIN. | S. SOIL PIPES. |
| R. RADIATOR. | V. VENT, SHAFT OF W. CLOSETS. |

when also the openings in the floor of the chamber can be partly or wholly closed, and the ventilation aided by the flues, 14 in number, in the outer walls of the building. The ventilating-chamber is warmed, when necessary, by the steam-pipes shown in the drawing.

With the fresh air entering the ward at an average velocity of 160 feet per minute, which, the air-meter indicates, is easily obtained, there are given to each patient 6,000 cubic feet of fresh air per hour, and the whole volume of air in the ward, about 47,600 cubic feet, or 1,700 cubic feet per patient, is changed between three and four times hourly. The average of many observations has given a velocity of the inflowing air of over 200 feet per minute, without discomfort from draughts, equal to about 8,000 cubic feet per hour to each patient. Artificial heat is only occasionally applied to the ventilating-chamber.

In cold or windy weather, when the movement of air is rapid, the volume of warm air passed through the ward is very largely increased, and partial closure of the inlets and outlets is required. The experience of a winter's use of the one-story pavilions proves the heating and ventilating arrangement to be very controllable, and with proper care a very uniform temperature and freedom from draughts has been obtained with the very generous air supply. In general, it can be said that the peculiar arrangement of the apparatus, so that it cannot be interfered with by persons not appointed to adjust it, removes entirely the usual uncertainties and complications of such appliances, while it simplifies them and makes them easily managed.

RECONSTRUCTION.

The faults of the former system of heating and ventilating by impulsion, and the alterations of the older pavilions because of errors of construction, especially of their basements, have been mentioned. These defects are illustrated, in Plate No. 6, by a section of the three-story surgical pavilion, which shows also the new method for furnishing the fresh-air supply, etc. The basement-floors, as already

described, were about $3\frac{1}{2}$ feet, and the bottom of the fresh-air ducts about 7 feet below the ground level. The fresh air being warmed just before entering the building, the duct was then divided so that the warm and cold air passed separately into the wards (see page xxv.), where its delivery was controlled by the mixing-valves to produce the desired temperature.

While the floor of the air-duct was cemented, the soil was left loose and uneven in the other sub-basement spaces. Lying upon this loose earth, the soil-pipes traversed these spaces from many directions to enter a sort of brick chimney. Of these chimneys there were several, each receiving a number of soil-pipes, and from these the drains passing through the foundation-walls conveyed away the sewage. The walls of the basement story were covered with sheathing, and lath and plaster finishing, behind which were spaces where vermin was harbored, and foul air could rise from under the floors.

The soil-pipes from the stories above were encased behind the sheathing in the corners of rooms, as shown in the plan. Certain steam-pipes, water-pipes, etc., necessarily passed along the warm-air duct, and gave off branches passing into the sub-basement air-spaces, so that there was more or less free communication of air through the openings in the wall between the duct and these spaces. The results of such arrangements have been the cause of much criticism of the hospital, and much anxiety in its management. Efforts were made, in 1873, to counteract the evils. In the annual report of the superintendent of the hospital for 1873-74, the writer states that "some extra labor has been employed during nearly all the year in the process of cleansing places difficult of access in and about the institution. The spaces under the basement-floors of all the buildings were thoroughly 'policed,' the surface of the earth was removed, and replaced with clean material; the connections of soil-pipes with the drains were carefully inspected, and the drains repaired in many places to stop the escape of air from the sewers into the buildings, and all the surfaces of these hidden places, and of the main air-ducts and cellars, were whitened with

lime-wash. The flues for fresh and foul air, of which there are many, and which require such attention every year, were also carefully and thoroughly cleansed of their accumulated dust, etc. The importance of constant attention to these matters cannot be overestimated; and the annual expenditure of a few hundred dollars in this way will certainly improve the sanitary condition of the hospital, and must even exert an appreciable influence upon the death-rate.

"These things are mentioned here also to invite attention to the peculiar difficulty of maintaining a proper condition of things in this respect, owing to peculiarities of arrangement and construction of the buildings. It is hoped that this can be remedied when improvements now proposed are made.

"The evils of occupying the basements of the pavilions, as wards for the sick, cannot be too strongly urged; and not only is it absolutely impossible to properly ventilate them, as well as their sub-basements of perfectly confined air-space, but the influence of this state of things upon the sick people in the three stories above must be positively pernicious. It is not the least of the present dangers that new defects in the drains and leakages from the soil-pipes may occur unobserved from time to time in these underground places, to be followed by noxious exhalations from their contents partially absorbed in the soft earth.

"The proposed transformation of these basement-wards into open cellars, with free air-space, cemented floors that can be frequently cleansed, and bare walls that can be whitened with lime-wash several times a year, will overcome evils of great and increasing magnitude."

Subsequently there was published, in the annual report of the State Board of Health of Massachusetts, some criticisms of the sanitary condition of the hospital, in a paper on "Hospitals," by Dr. George Derby, who ascribed the evils to the common failure of all artificial systems of ventilation. In an article on "Ventilation of Hospitals," in the "American Journal of the Medical Sciences," for October, 1875, defending artificial ventilation, Dr. Isaac Ray also criticised

the hospital; but ascribed its evils to recognized defects of construction, holding the fan to be blameless.

An examination of Plate No. 6 will make plain the condition of the sub-basements, and what influence it must have had upon the sick in the basement-wards themselves, and in the wards above.

A marked abatement of the evils followed the process of cleansing in 1873, and the repetitions of this process, but nothing short of radical reconstruction could prevent the danger of their recurrence. As soon as the occupation of the new buildings permitted the abandonment of the old basements as wards for the sick, the long-contemplated alterations were begun. The wood-work was all removed, gravel filled in, and a floor made of concrete and cement, provision made for altering the water-closet system, as already described, and the method of introducing and controlling the fresh-air supply made to correspond to that adopted for the new buildings.

In the drawing, the cold-air box leading from the basement window to the steam-radiator is represented as partly cut away, to show the water-closet ventiduct beyond in the farther end of the building. The capacity of the inlet-flues for fresh air is considerably increased, but it now remains to replace the old arrangement for the outlet of foul air by constructing aspirating-chambers or flues.

The fresh-air supply of the isolating-wards, instead of being forced by the fan from the cellar of the building through small flues, — equivalent to about 36 square inches for each room, — is now admitted through openings in the outer wall under the window and near the floor in each. A steam-radiator is placed in front of these openings and surrounded by a casing of wood, lined with tin, having a register in front, and covered with a wide marble slab forming a table on a level with the window-sill. These are shown in the plans of the buildings in Plates 1 and 2. A simple arrangement of sliding-valves within the casing controls the temperature and volume of the entering air, and the placing of steam-pipes in the originally ample and well-arranged ventilating chamber in the roof makes the heating and venti-

lating of the building efficient and controllable. With an area of inlet-opening of one square foot and an inflowing velocity of 200 feet per minute (it has often been found by the air-meter to be more than 5 feet per second) the air of the room is entirely changed from three to four times per hour. It is believed that this result is attainable at all times.

The observations that have been made with the air-meter, etc., were only experimental, and simply to test the general efficiency of the heating and ventilating apparatus; and it is believed that a properly conducted series of observations will certainly show results no less favorable than are indicated in the data given.

In what has been said of the use of the fan it is not intended to imply any condemnation of the system it involves. Local difficulties in properly carrying out such a system were, perhaps, sufficient to account for its failure here. If the fresh-air duct could be made air-tight, and properly accessible for purposes of cleansing of dust, etc., it must be admitted that the fan might be used with advantage for at least the two older pavilions, which now lack all artificial ventilating force.

The hospital was built upon well and carefully considered plans, and its general arrangement was excellent, though having some deficiencies which only actual experience in its management could point out and supply. The special defects of construction in some parts of the hospital are not noticed as exceptional, for it is lamentably true that they are too common in private dwellings as well as in public buildings.

THE TREATMENT OF EMPYEMA BY PERMANENT OPENINGS, WITH CASES.

BY JOHN G. BLAKE, M.D.

IN late years, the treatment of empyema has become chiefly surgical. We do not leave patients to the chance of emptying collections of pus in the pleural cavity by expectoration, or to wait till pointing takes place, as in an abscess. Perhaps in no department of medicine have more satisfactory results been obtained than in this, by the adoption of the more active and rational methods of treatment now practised.

In 1869, the writer had under treatment in this hospital a case of pleurisy, with effusion, which afterwards became purulent. An incision was made at a point between the ribs, after the patient had been etherized, and a large quantity of pus escaped. The cavity was kept drained, and washed out daily with warm water, slightly carbolized. After three months the man entirely recovered, and has since remained in perfect health. This was the first case treated surgically in this place, and at the time was original with myself. Cases of a like character may have been similarly treated by other practitioners elsewhere, but none had then come under my notice. This case has never been published.

Since 1869, I have treated ten cases of empyema by incision, and nine have recovered. In 1872, a report of four of these was published in the "Boston Medical and Surgical Journal," which received favorable notice from Dr. Bowditch and the profession. The remaining five have occurred since, and the results in all cases have been equally gratifying.

The method of operating has been by making an incision from one to two inches long, parallel with the ribs, between the seventh and eighth, a little inside the scapula, and toward

the axillary line. This point, although objected to by some writers on account of the greater liability of adhesion and deposit of lymph, possesses the advantages of being the most dependent in the position easiest to the patient, and of allowing perfect drainage. I have found it very difficult to keep such an incision open, so as to have continuous drainage, and, indeed, in all my cases have been compelled to resort to a tube of some sort, — either a spiral wire, covered with gutta-percha, or a gum-elastic catheter, fastened to a shield, and kept in position by adhesive plasters or tapes tied around the body. The use of the catheter is discountenanced by some on account of the danger of its breaking in the chest; but with care, and by changing as often as may be necessary — once a week, for instance — it has been found to answer the purpose very well. Metallic tubes, with shields, are much more painful, and have been very generally discarded in the United States.

English writers recommend the adoption of the antiseptic plan in the performance of the operation, and claim that by it the process of cure is accelerated, and that its benefits far outweigh the extra trouble attending its employment. Several of my cases were treated before Prof. Lister's views had been generally adopted, so that I have no personal knowledge of their merits. Any plan that shortens the long and tedious duration of the after-treatment is to be welcomed, and I shall gladly test his suggestions when the opportunity again presents. Recent German writers recommend the excision of an inch of one of the ribs when difficulty has been experienced in keeping the chest free from accumulations of pus, and the decomposition and dangers arising therefrom. The success attending this procedure has been satisfactory. Judging from my own experience, the necessity for such an operation must be very rare, and only the most urgent symptoms would call for it. Indeed, its performance without anæsthetics would be almost impossible, and our unfortunate experience with these has lessened their use in our city at least. The only death following incision in my practice was after the administration of ether; and I think Dr. Bowditch has had a similar result.

The probability of cure by simple tapping, and withdrawal of the pus, has not been encouraging, perhaps owing principally to the fact that nearly all our cases occurred in adults. I recall one, however, of a boy ten years old, whose recovery followed the use of the aspirator alone. The quantity of pus here did not exceed ten ounces, and there was no re-accumulation. A sufficient number of favorable results in children has been reported to justify postponement of the incision until repeated withdrawals of the pus fail to effect a cure. In adults, the rule is to remove the pus once by tapping, and on its accumulation to make the permanent opening. I am tolerably well satisfied that it is better to avoid unnecessary delay, and that, where pus is found in large quantities, operation by incision should be resorted to immediately.

The after-treatment depends a good deal on the character of the pus. When it is free from odor, it is not desirable to begin syringing and washing out the cavity at once. Such procedure may be attended with injurious, and even fatal, results, and cannot fail to be irritating. Sudden deaths, attributed to it, have been reported quite recently. Days and weeks may be allowed to elapse without resort to it, if the character of the discharge is not offensive. I have, however, seen cases where disinfecting and thorough washing was required from the time of the operation, and was followed by the happiest results.

No absolute rule can be laid down that will apply to all cases, and the physician must rely upon his own judgment and the particular symptoms with which he has to deal as his best guide. However much may be expected from the adoption of Prof. Lister's plan, there are cases where it will not apply. I have removed from thoracic cavities pus of the most foul-smelling character, where syringing thrice daily for weeks with a strong solution of carbolic acid was necessary. These cases eventually recovered completely.

The class of cases suitable for operation is a matter of most serious consideration for the physician, and will call for the exercise of his highest judgment. Commencing phthisis and long-existing pyo-pneumothorax might reasonably be

supposed to contra-indicate it; and yet wonderful results will sometimes follow its performance in the last-named disease. Case I. illustrates this. Certainly a chest half full of pus mixed with air, daily expectoration of from half a pint to a pint, harassing cough, night-sweats, œdema of the whole body, and a large amount of albumen in the urine, would make up a total that must seem well-nigh hopeless. Yet this patient made a perfect recovery, and when exhibited to the Society for Medical Observation some months after, the difference in the respiratory sounds was barely perceptible between the affected and the healthy lung. A single case of this character teaches a great deal, and I believe it a duty to attempt cure where death under existing circumstances is inevitable. I have seen the subject of this case frequently since, and he has developed into a strong, healthy man.

The case of James D. (Case VI.) illustrates recovery from a condition presenting the signs of commencing phthisis. Indeed, after admission to the hospital it was thought inadvisable to make a permanent opening, because of the existence of tubercular disease at the apex of the other lung. The usual signs were very distinct, crackling rales, dulness on percussion, etc. This case proved to be one of the most rapid and complete recoveries in my experience, and the cure has been permanent. I have now under treatment a case in which empyema, with perforation of the lung, existed for three years before coming under my charge. Within fifteen months, tapping has been done three times: first, with the effect of removing two quarts, three months after, only a pint, and recently, after a year's interval, a gallon of thick, creamy pus, of the consistence of molasses. The advisability of a permanent opening has been the subject of most perplexing consideration to me. Circumstances thus far have rendered it impossible, and as the patient enjoys sufficiently good health to enable him to be out and about, he naturally shrinks from the pain and confinement which an operation would necessitate. I have urged more frequent tapplings, twice or three times a year, perhaps, if it is found that the pus collects sufficiently.

I cannot set forth my conclusions better than has been

done by Dr. Henry I. Bowditch in his writings on the subject, more particularly in a communication to the "Cincinnati Lancet and Observer" of June, 1876, which I here append.* I wish to express my gratitude for the hearty encouragement and valuable counsel it has been my good fortune to receive from this distinguished authority. To him, in an eminent degree, belongs the credit of having brought the treatment of this class of chest diseases to the present gratifying stage of success; and whatever good results have attended my operations are due in a great measure to following the path which he has marked out.

CASE I. — S. B., aged 15, errand boy, of delicate constitution, though enjoying fair health, took cold four months ago, and in a few days well-marked symptoms of pleuro-pneumonia developed, involving almost the entire right lung. He was treated on what is known as the "supporting" plan, stimulants and nutritive drinks being administered in moderate quantities. The case did not improve, and, at the end of a month, the boy's condition was worse than at the beginning. To be sure the acute symptoms had subsided, but there remained a chronic debility, with quite frequent cough, and copious expectoration of a purulent character. He began now to lose flesh and have profuse night-sweats, and quite marked dyspnœa, with increase of purulent expectoration and more frequent cough, particularly at night. Percussion and auscultation of the chest gave dulness and absence of res-

* "First. Children with empyema are more likely to recover than adults; nearly all recover.

"Second. Adults with recent trouble are in a more favorable condition than those in whom the disease has lasted many months. When the disease is recent the lung expands rapidly, and improvement begins from the time of operation; when chronic, expansion is slower, may be only partial, or, possibly, may not occur at all.

"A permanent opening may be made in two ways, either by a large trocar and canula, and the insertion of a drainage-tube afterwards, or by making an incision one or two inches long between the ribs, and keeping it open. The latter is more painful, but is the better operation.

"Do not make a permanent opening in cases where there is well-marked Phthisis.

"If the pus is sweet, injections are not required. If there are signs of purulent absorption, use carbolio-acid solution (one or two grains to the ounce of warm water is generally sufficient), wash out the chest twice a day, or oftener, if necessary, and be sure you have constant drainage."

piration over the entire right side of the thorax as high as the middle of the scapula. For the next two weeks, there was but little change, except that he became gradually weaker and began to have œdema of the face and feet. Examination of his urine showed the presence of a small amount of albumen.

Having exhausted the resources of medical treatment, I requested Dr. Knight to see him, in consultation, to consider the propriety and chances of success of opening the chest. The result of Dr. Knight's examination was that there was air as well as fluid, probably pus, in the cavity of the pleura, and communication between the bronchial tubes and the purulent collection. There could be no reasonable doubt that the pus which the boy was at this time expectorating in large quantities (amounting once to a quart in twenty-four hours, and sometimes, in a single fit of coughing, filling an ordinary spit-cup holding half a pint), came through an opening in the lung from the pleural cavity. Succussion produced the most distinct metallic tinkling that I have ever heard; the splash of the pus against the walls of the chest, and the tinkling resulting from the dropping of the fluid from the walls of the compressed lung, being clearly audible. The boy's condition seemed very unfavorable to Dr. Knight, and while not opposing an operation, he did not favor it.

The following day, feeling that the patient's only chance for life depended on the operation, I opened the chest, with the assistance of Dr. M. F. Gavin, two inches below the inferior angle of the right scapula and a little to the outside. Three pints of pus, slightly fetid, with a peculiar acid odor, came away. A large-sized trocar was used, and the opening was afterwards enlarged by means of an ordinary scalpel and director, without the aid of anæsthetics. The operation of enlarging occupied but a few seconds, and, considering the boy's enfeebled condition, it was borne with great fortitude.

A piece of gum-elastic catheter, properly secured, was left in the wound to prevent healing and keep the pleural cavity constantly drained. A stream of warm water was passed into the thorax, and repeated until it came away quite clear.

The patient had a comfortable night, with the assistance of an opiate. The next morning and evening the warm-water washing was repeated. Finding the catheter rather inconvenient, I had a silver canula made, resembling a tracheotomy tube except that it was straight, and fastened with a piece of elastic tape around the body; the free external opening connected with a large sponge to absorb the discharge. This answered well for a time, but as soon as the boy began to move about, the unyielding nature of the material caused pain on inspiration, and after a few days it was removed. The patient's mother soon learned to introduce it, and, during the remainder of the treatment, did so twice daily. Meanwhile, whenever he coughed, pus came through the opening, and there was no chance for any considerable amount to accumulate. From the time of the operation, the boy's condition began to improve; the cough and expectoration diminished steadily, œdema disappeared from the face and feet, the appetite and strength returned, and in six weeks from the date of the operation all discharge had ceased and the opening was allowed to close. At the present time, his condition is better than before his illness, and, his mother tells me, than for many years past. When last examined by me, respiration seemed about equally good on both sides of the chest, and the expansion of the affected side seemed to be complete.

CASE II. — For the following I am indebted to my friend, Dr. Gavin, whom I assisted at the operation.

"H. K., aged 28, was always healthy, no hereditary tendency to tuberculosis. Four days previous to my first visit he was seized with acute pain in the right side, great difficulty of breathing, and cough, with but little expectoration. When I saw him, the respiration was quick and attended with slight dyspnoea, hot skin, pulse over 100. Examination of the chest revealed pleurisy of the right side with effusion enough to half fill the right pleural cavity. Morphine to alleviate pain, expectorant mixture for cough, together with digitalis and squills, were prescribed; afterwards, the right side of the chest was painted with a strong solution of iodine. No

relief followed. The patient continued to grow worse, the dyspnœa becoming very severe, obliging him to lie in a semi-recumbent posture. I recommended the operation of paracentesis thoracis, but he declined to have it done, and then (July 1st) changed physicians. I learned that he was afterwards treated with cod-liver oil, tonics and stimulants.

"Sept. 3d, I saw the patient again. He was very much reduced in flesh; had night-sweats; frequent cough, with purulent expectoration, very profuse and offensive; pulse weak and about 140. Examination of the lungs showed absence of respiration on the right side, with flatness on percussion over the back and front extending to the clavicle. Crackling was distinctly audible under the clavicle. Intercostal spaces filled out. Great dyspnœa on the slightest exertion.

"Sept. 11th, having given his consent to an operation, the patient was placed in a chair and an incision made two inches long, at a point corresponding to the angle of the right scapula, about two inches below and extending obliquely downwards. A large trocar was now plunged into the chest, followed by the discharge of over sixty ounces of very offensive pus. The breathing at once became easy and less frequent. The chest was washed out with warm water, and the canula allowed to remain in. Patient spent a good night; cough not nearly so troublesome, but he complained of soreness from pressure of the canula, which was accordingly removed and replaced by a large gum-elastic catheter, tied so as not to slip out. This was allowed to remain in three days, when it was withdrawn and not again introduced.

"For two weeks the chest was washed out twice a day, by means of a Davidson syringe, with warm water and occasionally a weak solution of chlorinated soda. Tonics and stimulants were freely used.

"Improvement followed immediately on the operation, and continued steadily until health was completely restored. The chest wound remained open for 35 days. The lung expanded slowly, expectoration ceased, and when last seen, about eight months ago, the man was working at his trade, and, to use his own words, 'never felt better.' Examina-

tion of the chest showed vesicular breathing over the whole of right side, but less pure than over the left.

"Dr. Blake assisted at the operation, and can testify to the fetid character of the pus expectorated and its identity with that removed by the operation. The odor was as bad as is found in gangrene of the lung, and indeed suggested that at first; and the quantity precluded the possibility of any other source than the pleural cavity."

CASE III. — Mrs. C., mother of four children, living in a dark and damp court in South Boston, was attacked with symptoms of pleurisy of the right side after exposure to wet and cold. She was treated by four or five physicians, successively, without relief. I saw her four weeks from the commencement of her illness. At my first visit she was sitting up in bed, breathing quickly, evidently in great distress, with blue lips and anxious expression of countenance. An examination of the chest showed the cicatrices of several large blisters, some of them not yet quite healed. Percussion and auscultation revealed flatness and absence of respiration over the entire right side of the thorax, front and back. The intercostal spaces were obliterated, and the whole side seemed rounded and fuller than the left. The necessity for surgical interference was obvious and urgent, and the patient at once acceded to my proposal to remove the fluid. Having obtained an aspirator, I proceeded, without assistance other than the woman's husband contributed, to operate. The trocar was introduced about two and one-half inches below the inferior angle of the scapula, and my surprise was great to find that, instead of serum, I was removing pus. The short period of the existence of the disease seemed to preclude the possibility of the fluid being of this character. I continued to remove it until the coughing became so annoying that the patient was growing quite distressed. The quantity withdrawn amounted to sixty-eight ounces.

Believing that a permanent opening would be required in order to effect a cure, I admitted her to my ward in the City Hospital, and ten days after the first operation made the necessary opening, in the presence and with the assistance

of the hospital house-officers, removing at that time a quart of pus. The after-treatment consisted in washing out the pleural cavity twice daily for three weeks, once daily during the fourth week, and every second or third day from that time until the discharge ceased, generally using simple warm water, and occasionally a carbolic-acid solution of a grain or two to the ounce.

The woman's condition improved steadily from the time of the operation; the cough ceased in a few days, and in a week she was out of bed and could move about the ward. She was discharged from the hospital eight weeks from the day she entered, and is now quite well.

CASE IV. — A. P., shop-girl, aged 23, entered City Hospital March 11, 1873. Parents died of phthisis. She had had some dyspeptic ailments for about six years. Two years ago she had "pneumonia," and a few months after, "chills and fever," which lasted almost all summer.

Last fall she had an attack of "pleurisy," affecting the left side, which confined her to bed nine weeks, and from this she thought she had never fully recovered, as there had always been more or less pain in the left side and dyspnoea after that time.

About February 1st, she had a chill, followed by an increase of pain in the side and dyspnoea; cough with free, whitish, frothy expectoration and profuse night-sweats. On entrance to hospital, six weeks after the attack, she was able to sit up most of the time, and while in bed assumed an inclined position. Symptoms as just described.

Physical examination of the chest showed no marked change on the right side. The left side was evidently enlarged and the intercostal spaces were obliterated. Percussion and auscultation gave flatness and absence of respiration from base nearly to apex, where bronchial respiration was heard. The heart was displaced to the right. On March 16th, paracentesis thoracis was performed. A trocar was introduced between the eighth and ninth ribs, below the angle of the left scapula, and eleven pints of pus withdrawn. Immediately after the operation, the opening was enlarged without the aid of an

anæsthetic. A gum-elastic catheter was introduced, and the pleural cavity washed out with warm water. The catheter was retained and the washing repeated twice a day. The patient expressed great relief from the operation, and improvement continued steadily until the morning of March 21st. At my morning visit I found her in a state of collapse, from which she was with great difficulty partially roused. She sank away again, and died in two days. The causes, we afterwards ascertained, were entirely disconnected with the operation or the disease.

CASE V. — John A. H. entered hospital March 23d, 1875. He had taken cold February 3d, and had been confined to his bedroom since. First felt chilly, then feverish; had pain in head, and cough. Said he had an attack of pleurisy; manner was very agitated and nervous. Had been tapped four times by Dr. Marion; eight or nine quarts of serum, in all, were drawn off. Tapped last time one week ago. Has slight cough while sitting up, which is much aggravated by lying down. Left side is the one affected. Sleeps fairly. Ordered quinia and bromide at night.

March 27th. Ale was ordered.

March 30th. Tapped in left side, between seventh and eighth ribs, below scapula. Patient asked for operation for two or three days, on account of dyspnœa. Heart was pushed over to median line. Pus being found, a permanent opening was made and a flexible rubber catheter passed in for drainage. About three pints came away. Patient had a chill after the operation; heaters were applied to the feet, and hot whiskey was given; these gave relief and sleep.

March 31st. Had a comfortable night. Some discharge this morning. Ordered quinine, ale and a good diet.

April 3d. Cavity washed out with warm water. Bromide and morphia (gr. $\frac{1}{4}$) at night. For last three days discharge of pus has been very small. Tissues at the side of the opening are getting thick and œdematous. As it seems doubtful if pus is passing through the tube, it is withdrawn.

April 5th. Choral hydrate (one grain to one ounce of water) is used for washing out cavity.

April 6th. Carbolic acid (one grain to one pint of water) is ordered for injection.

April 11th. *R.* Acidi salicylici, 3 i.; sodæ phosphatis, 3 iii.; aquæ, 3 viii. *M.* Dilute once, and use for dressing and injection.

April 16th. Discharge is becoming less. Respiration can be heard, with sonorous rales, nearly down to the angle of the scapula. Whiskey.

May 22d. Put sea-tangle tent in opening in chest.

May 28th. Discharged relieved.

NOTE—"Recovered at his home, in Brighton, under the care of his former physician."

CASE VI.—James D., a porter, entered hospital Nov. 27, 1874. Well till four months ago; then taken with sharp pain in left side. Pain increased by long inspiration. Chill, cough, and expectoration. Soon after, he was aspirated, the needle being introduced two inches below angle of left scapula, and six pints of clear fluid withdrawn. Did not improve much in health; cough and expectoration continued; frequently had cold sweats at night. Seven weeks ago was again aspirated near same place, and a few ounces of pus withdrawn, since which he thinks he has been losing strength more rapidly. Has lost appetite.

Present condition: in bed; face pale and anæmic; cough urgent; expectoration free, and muco-purulent; tongue furred and appetite poor; some pain in left side; bowels regular; has headache at times; dulness over upper third of left chest, in front and behind, with diminished respiration; a number of mucous rales in region of left nipple; flatness over lower two-thirds of chest, with almost entire absence of respiration; right chest normal in percussion and auscultation; temp., 101°; pulse, 120. Iron and cod-liver oil ordered.

Nov. 29th. Had profuse night-sweat last night and this morning. Expectorated large amount of purulent matter; appetite very poor; metallic tinkling heard in region of left nipple.

Dec. 1st. An attempt was made to make a permanent opening about two inches below angle of left scapula. It failed, from shortness of knife. Chest walls seemed thick-

ened. An aspirator needle being introduced, two ounces of pus were withdrawn.

Dec. 2d. Quiet night; is comfortable. Expectoration is much less.

Dec. 6th. Cough very troublesome. Brandy.

Déc. 14th. Cough very urgent; expectoration copious and purulent. Ale instead of brandy.

Dec. 26th. On auscultation of right lung, vesicular quality slightly diminished under right clavicle; over left front, mucous and subcrepitant rale; no dulness on percussion over right front; dulness over lower third right back, with subcrepitant rales; upper two-thirds right back, respiration jerky, with no rale; flatness over left back, with well-marked friction sound; diminished respiration heard over upper two-thirds; absence of respiration over lower third of back.

Jan. 7th. Pain last night relieved by sinapism, followed by spongio-piline wet with laudanum.

Jan. 19th. Slight want of tone under right clavicle; left front, woody tone on percussion; respiration exaggerated over right front; bronchial respiration over left front, with crepitant rales on forced inspiration or coughing; crepitant rales from one inch below nipple to second rib; want of tone in upper half of left back; lower half dull; some dulness over lower third of right back; respiration distant; mucous rales all over left back on cough.

Jan. 29th. Sitting up dressed. Improving.

Feb. 16th. Aspirated, and eight ounces of pus withdrawn. Pus looks same as that coughed up. The operation stopped all expectoration, and rendered patient quite comfortable. Trocar was entered below, and at outside angle of left scapula.

March 2d. Permanent opening made. The needle was first introduced and a few ounces of pus withdrawn. Cough much relieved. Cavity to be washed out with solution of carbolic acid (gr. i.), in glycerine 3 i., and water 3 i.

March 12th. Since operation, cough has almost entirely ceased; appetite has improved; no pain; discharge of pus slight, and free from smell; tastes carbolic acid of the

injection if he coughs during injection. Is syringed twice a day.

March 23d. Discharge continues to decrease; sleeps and eats well, and is getting fleshy; no cough; is taking brandy, cod-liver oil, quinine and iron.

April 12th. Opening closed; air enters throughout bottom of lung.

April 15th. Respiration pretty good down to angle of scapula. Below that it is feeble. No discharge. Discharged well.

CASE VII.—Matthew D., aged 25, laborer, born in Ireland, entered hospital June 10th, 1869. Had been previously well. Five days before was attacked with headache, pain in back and legs, chills, nausea and vomiting, severe pain in right side of chest, increased by long inspiration. Pulse, 136, weak; respiration, 32; temperature, 102° to 104° . Flatness on percussion over lower half of right chest, with almost complete absence of respiration. Ordered five ounces of sherry per day and liquid diet. Later there was some lividity of lips, and the tongue became dry in centre. Sputa whitish and frothy.

By the 15th the temperature had risen to 105° , but the general condition was about the same.

June 25th. Physical signs nearly the same as before. Chest was punctured between seventh and eighth ribs, and three ounces of pus withdrawn. An abscess at point of chin was opened, and an ounce of green offensive pus removed. Ordered five grains of sulphite of soda every three hours. Another abscess appeared at outer edge of right scapula. Cough continued to be very troublesome.

July 3d. Physical examination showed left side of chest normal. Right side flat on percussion, with bronchial respiration, most marked under right clavicle. Considerable œdema under right axilla extending below false ribs. Tongue red and dry, not coated. Patient eats and sleeps well. Temperature from 101° to 102° . Patient becoming weaker and more emaciated. Sherry changed for four ounces of brandy.

Physical signs remained essentially the same. The right side was enlarging, and showed tendency to point.

Sept. 2d. Abscess in side was opened and about a pint of pus obtained.

Two days later a free opening was made, and eight ounces more were removed. The opening discharged freely. General condition improved. Tongue began to resume its normal appearance. Pulse fell to 100 per minute.

Sept. 16th. Appetite had become poor, and patient was weaker. Resonance on percussion fair over upper half of right front, but no respiratory murmur was heard. Cough troublesome, and sputa abundant.

R. Liq. morphiaë sulph., ʒ ss.

Syr. tolutani, ʒ i.

Syr. limonis, ʒ ss.

Sig. ʒ i, p.r.n.

Porter given at night, and one grain of quinine three times a day; sulphite of soda omitted.

Sept. 30th. Appetite had improved. Discharge had been offensive for several days. Had a moderate attack of diarrhoea lasting for a week, which yielded to appropriate remedies, but greatly weakened the patient, so that he was unable to sit up.

Oct. 8th. Cavity of the chest was washed out, and about ten ounces of thick pus removed. To be syringed every day with warm water.

This was changed on the 14th to sixteen grains of carbolic acid to the pint of water.

The discharge rapidly decreased, and had entirely ceased by the 15th. Appearance had greatly improved. Bowels were yet occasionally loose.

Oct. 18th. Patient was able to sit up.

Oct. 20th. The wound in the side had closed. Very little cough. Emaciation still marked.

Oct. 24th. Patient had so far gained strength as to walk out in the yard. Feet swollen and cedematous. Has profuse night-sweats.

R Zinci oxidi gr. v. every night.

Brandy changed to Irish whiskey. Urine heavily loaded with urates, but contains no albumen.

He steadily improved in strength and flesh. Œdema of feet disappeared.

Had no night-sweats on Dec. 8th, and oxide of zinc was omitted. He was discharged well on the 20th.

CASE VIII. — Phoebe W., aged 8 years, born in England, entered hospital June 1, 1869. No hereditary tendency to disease. Was always well until eight months before entrance, when she had measles, which were followed by pleurisy, three months ago, in left side. Since then, she has steadily been losing flesh and strength. Is quite pale and emaciated. Has little pain or cough, except upon exertion, which excites both. Whole left side of chest was found flat upon percussion. Bronchial respiration over upper half of left back; indistinct or absent below. No rales upon auscultation of left side of chest. Respiration puerile upon right side. Front of left side of chest quite prominent. Heart on right side of sternum. Paracentesis thoracis was performed, and three ounces of thick purulent fluid were withdrawn.

Next day prominence of left chest was much less. Bronchial respiration well marked in upper half of left side of chest. She could lie in any position. No rales. Flatness at upper part of left back; modified resonance at middle and angle of scapula. Was ordered two grains of Dover's powder at night.

June 4th. Patient slept without opiate. Can lie on both sides and on back, which she could not do before operation. Appetite improved. Has been walking about ward. Pulse, 120; strong and regular.

Discharged relieved.

June 12th. Patient re-admitted. After leaving the hospital lived in a low, damp place. Lost appetite and strength. Complains of pain in left side. Some dyspnoea; chest is much enlarged. Below the sixth rib is a large, red swelling. Opening made below angle of left scapula, and canula inserted; no exit of pus. Swelling then opened with lancet

and about eighteen ounces of pus were evacuated. Flax-seed poultice was applied and wound kept open.

Was ordered two drops of fusel oil t. d., and one grain of Dover's powder when needed.

June 15th. The patient was much more comfortable. The wound in the chest was freely open, and about eight ounces of pus removed by syringing.

The left side of chest was found rather contracted behind on the 17th, but resonant everywhere with a metallic echo. No pure bronchial respiration. Lung manifestly had not expanded, except slightly in the back, where there are a few sonorous rales. About two ounces of pus discharged in twenty-four hours.

Two days later, the discharge had become much lessened and was of good odor. Decided mucous rales at left apex. Heart sounds much more distinct on left than on right side of sternum. Left side of chest rather contracted, and left scapula nearer vertebræ than right. Pulse, 128, and of good strength.

The respiration was much improved on the 28th, being less tubular in character above left nipple; is less tubular in back, below angle of scapula; is nowhere so distinctly metallic as before.

The discharge of pus had gradually increased, so that upon the 30th it had become quite profuse, and the cavity of the chest was syringed out. Patient sits up nearly all day.

By the 5th of July the side had evidently contracted still more. Discharge still was free. Crackling all over back, most distinctly down to level of puncture. Patient up and about ward for past week. Has been steadily improving. Pulse, 120. Injections are continued twice a day of tepid water. This was changed on the 15th to one drachm of liq. sodæ chlorinatæ to one pint of water; and this again for a weak solution of carbolic acid.

Upon the 29th, the respiration had become vesicular above the nipple; below, broncho-vesicular. About two and a half ounces of pus discharged daily. Appetite good. Bowels open. Sleeps on either side; is up most of the time and walks in yard.

Aug. 18th. Patient was steadily improving ; had no cough ; appetite good ; discharge still free from cavity and had become increased by the 31st, but general condition had steadily improved.

Poultice and injections were continued twice a day until September 4th, when the injections were omitted and two ounces of tincture of iodine were injected into the cavity.

Sept. 9th. There was still an abundant discharge. Respiration more extensively vesicular. Patient had become very discontented in the hospital and cried to go home.

Discharged much relieved.

CASE IX. — Timothy L., aged 20, mechanic, born in Ireland, entered hospital December 15, 1876. Always healthy before present illness. Six weeks ago "caught cold," felt chilly, had headache, cough, with no expectoration ; pain in right side of chest, increased by long breath. These symptoms have increased in severity. The patient keeps his bed most of the time ; is feverish and sleeps poorly. Skin hot ; tongue moist, with light brown coat. Pulse, 80 ; respiration, 32 ; temperature, 103.7° . Much thirst ; represses cough because of pain ; very little sputa. Liquid diet.

December 16th. Morning temperature, 98.5° . Dulness of lower third of right lung in back, with diminished and distant respiration over same part. Doubtful friction sounds. Was ordered expectorants and sedatives for cough and pain, and tonics for general condition.

During the next month the patient's general condition remained nearly the same. Dulness had extended to the lower half of left lung. Sputa had become more abundant. Appetite was fair. Pulse ranged from 88 to 120 per minute. Temperature from 101° to 103.5° in evening.

In the latter part of January there was slight dulness over the lower part of the right lung, with coarse, mucous rales, but there was dulness over the whole of left lung, less marked over upper half ; respiration almost completely absent at base, but improved gradually towards apex, with prolonged respiratory sounds. Patient cannot lie on either side without causing

distress ; perspires very freely ; abundance of frothy, watery expectoration.

During the next month face became slightly puffy ; appetite became poorer ; a small amount of albumen appeared in urine. General condition nearly the same as before.

March 3d. There was but slight difference in measurement of the two sides of chest. Flatness on percussion over whole of left side of chest except at apex, where resonance is nearly normal. Respiration bronchial at left apex, front and back, and absent elsewhere. Right lung normal. Apex beat of heart in epigastrium ; cough very severe.

March 29th. There was discovered, about two inches below the left nipple, an excessively tender point, which seemed to fluctuate upon coughing. A flaxseed poultice was applied.

April 11th. A bistoury was introduced into the prominence, and ten ounces of pus were evacuated ; a poultice was applied. In a few days cough became much less severe and expectoration much less. Discharge from opening abundant. Opening in pleura is so small that a tube cannot be introduced.

During the next two weeks discharge continued free, about twelve ounces a day. Whiskey was increased to eight ounces per day, and he was ordered one and one-half grains of quinine three times a day.

May 1st. The patient was etherized, and the opening into the pleural cavity was enlarged.

The discharge rapidly decreased so that on the 14th it was only about one drachm per day. Spirits and general condition were much improved.

The discharge steadily grew less, and by June 12th had entirely ceased, and the wound had closed. Thenceforward the patient had considerable distress in chest ; cough increased ; considerable sputa.

June 15th. Abscess opened spontaneously ; considerable discharge of pus, which was followed by decreased severity of cough and cessation of expectoration. Whiskey was decreased gradually.

June 29th. The discharge from abscess had again ceased.

From this time the patient improved in flesh and strength, and was discharged well August 3d.

CASE X. — Dennis M., aged 30, laborer, born in Ireland, entered hospital Oct. 5, 1872. Was in hospital with pleurisy last May. Paracentesis was twice performed with temporary relief. Later he entered the Massachusetts General Hospital, and pus was drawn from the chest. Has since been tapped by physicians outside the hospital four times. The last one in charge made a permanent opening five days ago, evacuating four pints of pus. On entrance face is pinched and shrunken; respiration rapid and labored; skin cool; tongue clean and moist; appetite good, much thirst, slight cough except when he lies on right side. Pain confined to left side. Pulse, 138, and small. Incision opposite angle of scapula left side of chest. This was now closed at bottom; it was reopened, a free flow of pus following. A seton of lint was inserted, and a poultice applied.

Next day, the patient was much more comfortable. Pulse, 120, and stronger, and respiration less labored. Takes abundance of liquid nourishment and stimulants.

Oct. 7th, when the seton was removed, about ten pints of pus flowed from the wound. Discharge from wound grew less, and by the 17th had almost entirely stopped. General condition had become much improved. An ineffectual attempt had been made to syringe out cavity; but the smallness of the opening prevented.

During the next week the discharge from the opening increased and was offensive. Succussion was plainly heard several feet away from patient. Appetite failing, and but a small amount of nourishment is taken.

By Nov. 6th the wound had nearly closed. Discharge from it was thick and very offensive. Patient sleeps badly. Considerable dyspnoea and sense of oppression in epigastrium. Patient much emaciated, voice husky, cough very troublesome and very painful. A trocar was introduced near old opening, and considerable thick greenish pus was evacuated. Afterward the chest was washed out with carbolyzed water by means of aspirator. The whole amount of pus withdrawn was estimated at ten pints. A canula was introduced into the opening, and left. In the afternoon the patient became mildly delirious; pulse, 136; skin hot. Thence-

forward the patient steadily failed, the pulse becoming rapid and weak. Subsultus tendinum appeared, and he died Nov. 13th.

CASE XI. — Wm. H., aged 26, painter, born in Boston, entered hospital Nov. 14th, 1873. Had never been sick before. About ten weeks before was attacked with cough, severe pain in right side, increased by long inspiration. Lost appetite and was compelled to take his bed. In a few days his symptoms became somewhat relieved, and he was able to go about. Four weeks ago dyspnœa became troublesome and he became very weak. Had œdema of feet and legs. Now complains of dyspnœa, soreness in cardiac region, and slight cough with scanty frothy expectoration. Appetite fair, tongue clean. Temperature, 48.4°; pulse, 114; respiration, 32. Flatness all over right side of chest. Slight respiration heard along the spine, probably transmitted. Distant bronchial respiration over scapula and at apex; elsewhere absent. Right side of chest was tapped and three and one-half quarts of serum were drawn.

R. Tr. ferri chloridi, gtt. x.
Tr. digitalis,
Tr. belladonnæ, āā, gtt. x.
Spt. æth. nitrosi, 3 ss.

Sig. Give three times a day.

Nov. 27th. The chest was aspirated, and thirty-five ounces of serum were drawn, and again on Dec. 14th, and ninety-eight ounces of a thin purulent fluid were drawn, when the operation was discontinued because of distress.

Physical examination on the 21st showed feeble respiration to extend to point of scapula. Complained of night-sweats, and was ordered twenty drops of aromatic sulphuric acid three times a day.

The chest was again aspirated on the 24th, and two quarts of fetid pus were evacuated.

Again, on the 29th, nine pints of pus were drawn.

Jan. 6th. A permanent opening was made, and a considerable amount of thick pus was withdrawn.

It was found that about three ounces of pus drained away every day. Cavity was syringed out twice a day with carbolic acid and water, three grains to the ounce.

Jan. 14th. All previous recipes were omitted, and the following was ordered:—

R. Infusi gentianæ comp., $\bar{z}$ iss.
Acidi sulphurici aromat., gtt. x.

Sig. Give three times a day.

Eight grains of oxide of zinc were given at night for sweats.

Nothing abnormal was found in urine except an excess of urates. About eight ounces of pus drained away each day.

During the next two weeks the discharge of pus decreased to two or three ounces per day. Patient became very weak and appetite poor. Face swollen. All other medicine omitted, and one drachm of spiritus ætheris nitrosi was given three times a day.

Feb. 4th. Patient was delirious and very weak. Three ounces of brandy per day, as milk punch. Valerianate of morphia was given, p.r.n.

The delirium continued until the 5th, at times being very active; but the patient grew steadily weaker.

Towards evening, Feb. 5th, he became comatose, in which condition he remained until his death upon the 7th.

CASE XII.—Geo. H. G., aged 29, engineer, born in Boston, entered hospital Nov. 15, 1875. Health usually good. Habits good. Has had cough with scanty expectoration for four years; but has not lost flesh or strength. One year ago had a chill, followed by fever, every day for a week; since then, pain in side and cough have been pretty constant. Sputa moderately profuse, thick and yellowish. Has twice raised a teacupful of fresh blood. Has steadily lost flesh, and been troubled with dyspnœa. Two weeks ago was tapped by Dr. Bowditch, and ninety-five ounces of pus were

drawn off. Has less dyspnœa, but cough and pain in side persist. Appetite fair. Bowels regular. Pulse, 114; temperature, 99°; respiration, 32. The following was ordered:—

R. Tr. digitalis,
Tr. belladonnæ,
Tr. scillæ, āā, gtt. xii.
Tr. hyoseyami, gtt. xxiv.

Sig. Give three times a day.

Next day the dose was reduced to one-half, and half a drachm of spiritus ætheris nitrosi was added to each dose. Opium was given, p.r.n.

Nov. 21st. Paracentesis thoracis was performed, and forty ounces of healthy pus were taken from the chest. The recipe of the 15th was omitted and half an ounce of gin was given every four hours.

Two days later he was again tapped, and forty-three ounces of fetid pus were withdrawn. The heart was found pushed to the right side; the apex beat at ensiform cartilage. Twenty-eight ounces of slightly fetid pus were withdrawn on the 29th. All of the upper portion of the lung dilated freely. Resonance to inferior angle of scapula.

The patient was tapped again on the 1st and 7th of December, and four and twelve ounces, respectively, of sero-purulent fluid were obtained.

Cod-liver oil, ʒ i., t.d., was ordered, gradually increased to ʒ ss., t.d.

December 18th. Fifty-six ounces of fetid pus were drawn from the chest, and on the 31st a permanent opening was made about two inches below the angle of the scapula and a flexible rubber drainage-tube was inserted. Seventy-six ounces of fetid pus drained away. Chest was syringed out with a solution of carbolic acid. Patient became quite comfortable. One grain of iodide of iron was given three times a day. Because of the fetor of the purulent discharge, the chest was syringed out with a wash composed of carbolic acid, three grains, and water, one ounce, twice a day. Pulse, 120.

During the next month, the general condition became much improved, old dyspeptic symptoms disappeared, and appetite became pretty good. One to two ounces of pus drained away in twenty-four hours. But early in March, the patient began to have chills followed by fever in the afternoon, for which he was given six grains of quinine six hours before the expected attack, with favorable effect, so that on the 10th the quinine was omitted. The following was ordered as a wash in place of the carbolic acid lotion:—

R. Tr. iodinii, ʒ ss.
Aquæ, ʒ i.

This wash seemed to increase the flow of pus, and the carbolic wash was resumed.

Except considerable headache, the patient's general condition was much the same until April 6th, when he had a severe attack of pain in the upper part of left lung. Respiration bronchial in upper third of the left lung, except at extreme apex, where it was broncho-vesicular; respiration obscure throughout lower two-thirds; vocal resonance good; slight dulness on percussion over upper third of left back; marked dulness below.

During next month, the patient had several attacks of diarrhœa and a very irritable stomach, requiring great care in selecting food.

May 3d. The urine was found to contain a large amount of albumen and hyaline and granular casts.

There was little change until the 15th, when the stomach and bowels became more irritable. The tongue was red. Considerable pain in left side. Discharge offensive and thick. Prolonged expiratory murmur at right apex. Various remedies were given to allay gastric irritability and to check attacks of diarrhœa, with temporary relief. The urine contained an increasing amount of albumen and an abundance of hyaline casts. Pulse became rapid and weak. Other symptoms were aggravated, and the patient died June 19th.

Autopsy, nine and one-half hours after death. There were a few strong adhesions at the base of right lung, and some

soft ones higher up. No abnormal amount of fluid in right pleura. Right lung emphysematous, hardly collapsing when chest was opened. In upper part of upper lobe was a hard non-crepitant lump as large as a turkey's egg; this was made up of smaller patches of local inflammation, which nearly made it one continuous mass. In this mass and surrounding it were bronchi, stiffened and surrounded by inflamed lung, and scattered about these changes were a few tubercular granules.

At the lower border of the upper lobe was a large cavity containing decomposing blood. The middle lobe was small and irregular, and contained a few scattered spots of inflammation about as large as peas.

In the left pleura was a small quantity of offensive pus and an opening in the chest-wall, below the tenth rib, from which the pus escaped externally. The lung was adherent by several very strong bridges composed of lung and lymph. The lung was compressed to a cylinder not larger than the wrist, non-crepitant nearly throughout. In the upper half were a number of spots of cheesy degeneration.

Heart pale; valves normal; slight changes in aorta just above valves; spleen rather firm; stomach and upper half of intestine normal. In the lower half of small intestine the mucous membrane was thickened and had lost its lustre. In the large intestine this change was still more marked; one ulcer was found just below ileo-cæcal valve. Liver thick and hard, rather pale. Kidneys large, soft and flabby, their capsules pretty strongly adherent, but still could be torn clearly away; cortical portion pale ash color and seemed to almost surround the cones; tubules indistinct; both kidneys and liver showed beginning amyloid change.

CASE XIII. — Clarence M., aged 19, carpenter, born in Nova Scotia, entered the hospital April 12th, 1875. Has had good health until sixteen days ago, when he began to grow weak, and to have general *malaise*, which compelled him to go to bed. Has had diarrhœa for last week. Slight cough and scanty expectoration. Epistaxis last week; some headache. Tongue covered with brownish coat, dry in

centre. Slightly sore across base of chest. Abdomen distended, somewhat tympanitic, tender on deep pressure in right iliac region. A number of rose-spots on abdomen. Sibilant and sonorous rales throughout chest. No dulness. Milk and beef tea ordered with four ounces of brandy per day. Ten grains of Dover's powder at night. Next day had retention of urine, which was drawn with catheter. Five dejections per day, for which he was given a pill composed of

R. Cupri sulphatis, gr. ʒ.
Pulveris opii, gr. i.

He gradually improved, in fact had no untoward symptoms except another attack of diarrhoea, and when he neared convalescence was troubled with night-sweats.

May 10th. Some dulness was found at base of right lung.

May 19th. Dulness found over right front, with cracked-pot resonance at base. Upper third of right back dull on percussion; lower two-thirds flat. Respiration distant throughout right front, with moist rales above. Respiration in right back bronchial; most marked in lower half, with occasional moist rales. Respiration very distant at base. Vocal fremitus absent on right side. Puerile respiration over left side of chest. The right side of the chest was aspirated on the 25th, and eight ounces of dirty pus withdrawn. Succussion sound plainly heard.

The chest was again aspirated on the 30th, and a small amount of pus obtained, when a permanent opening was made and a drainage-tube inserted. The cavity was washed out with carbolized water, one part to forty-three, twice a day.

The discharge of pus during the next week was from one-half to one pint per day. The patient sweat profusely, yet seemed to gain some strength.

June 15th. Had another attack of diarrhoea which soon subsided; about same time had a rheumatic attack in left foot.

June 24th. Twenty drops of the tincture of chloride of iron and one grain of quinine were ordered.

July 2d. Physical examination showed broncho-vesicular respiration in front above line of incision, and indistinct bronchial respiration below. Flatness on percussion over entire back. Appetite improving. Discharge less. Pulse has ranged from 90 to 120 per minute. Temperature from normal to 102° for last month. Condition was nearly the same for the next month as regards all symptoms. Former stimulants were omitted, and he was given six ounces of sherry and a pint of ale daily.

July 25th. Physical examination showed right side relatively fuller; ribs immovable; intercostal spaces filled; relative dulness amounting to flatness on right side below nipple in front; right back, dulness above angle of scapula, flatness below. Bronchial respiration above and within line of nipple in front right side; absence of respiration below nipple and in axillary space. General condition improved. During next three weeks discharge continued free; some dyspeptic symptoms. Had an attack of diarrhœa lasting for ten days. Has been carried out in sun on bright days. Iron was omitted, and brandy substituted for wine. He gained strength after cessation of diarrhœa; some discharge from chest.

On Aug. 21st he was taken away by friends, relieved.

CASE XIV. — Frank S., aged 28, pedler, born in Azores Islands, entered hospital Dec. 24th, 1875. Always well until seven months ago, when he was attacked with pain in left side, cough and dyspnœa. Two months ago an opening appeared in side, through which pus has since discharged. As patient talks very little English, no farther history could be obtained. Pulse, 84; temperature, 98.4° . Natural opening enlarged by sponge tent, and an elastic catheter inserted, with drainage-tube attached. Cavity to be washed out with solution of carbolic acid, one part to eighty, twice a day. The cavity was found to hold but about two ounces of water. Physical examination shows comparative dulness on percussion over left front; respiration bronchial, faint at base; coarse and fine mucous rales all over left front, with crackling at apex. Back, no dulness on percussion in left;

slight dulness at right base, with fine mucous rales; bronchial respiration and bronchophony. Left back, respiration broncho-vesicular comparatively faint. Two openings appear in left side of chest; the upper one, through which the cavity is washed, is between the fifth and sixth ribs, just outside the mammary line; the lower, between the sixth and seventh ribs, about one inch outside mammary line; cicatrix of another opening just outside of last. Left side of chest decidedly flattened. From ensiform cartilage to spine, on horizontal line, is two and seven-eighths inches less on left side than on right.

Whiskey and cod-liver oil (of each two drachms) and quinine (two grains) were given three times a day. Everything progressed favorably, the cough becoming less and the discharge very small, until the 20th of January, when he had a rigor, but no unpleasant sequelæ.

A few days later he had so much improved as to be around the ward; but on the 28th there was found to be considerable cedema of the feet and legs, and about one-half of one per cent. of albumen in the urine. Twenty drops of the tincture of chloride of iron were given three times a day, and quinine was omitted, as it caused unpleasant symptoms. A week later, the cavity held but about an ounce, and part of the discharge was fibrinous flakes. The hands were swollen and painful for a few days, with some febrile action.

Upon the 11th of February the cavity again held about two syringefuls of water. Several examinations of the urine showed a somewhat decreased amount of albumen. Ordered an ounce and a half of gin per day. His general condition became considerably improved.

March 4th. The carbolic acid wash was omitted, and one or two grains of quinine to an ounce of water substituted, to be used once a day.

The discharge was considerably increased at first, but had decreased again by the 12th, and the cavity also, so that it then held but one ounce of water.

He had another chill, April 5th, without known cause.

During the night of the 8th there was a sudden and tem-

porary increase of discharge, so that four ounces of offensive pus were found in the bag in the morning; but by the 13th it again became small, and the pus laudable. The wash of quinine was omitted, and one used containing ten grains of quinia to the ounce. For several days, a considerable evening exacerbation of temperature occurred, rising to 103.8° or 104° , the morning being normal.

The urine on the 15th contained one and one-half per cent. of albumen and granular casts.

The thoracic injections were omitted on the 17th, the chest being dressed externally with oakum over the opening. Later there was some œdema and redness of parts for a time. Probe passed three inches into cavity.

The discharge ceased about the first of May. The patient's general condition was excellent. Œdema gone. Excellent appetite.

The right side of the chest measured forty centimeters in circumference, expanding to forty-one and one-fourth. The left side measured thirty-eight, not expanding at all. Measurements were made just below nipple. Respiration fair as low as third rib on left side.

Discharged well.

CASE XV.—Timothy K., aged 34, laborer, born in Ireland, entered hospital March 13th, 1876. Family history good. Patient had never been seriously sick before. Nine days before was attacked with chill, fever, thirst, pain in bones, sharp pain in left side, increased by long inspiration or cough. Cough, with scanty whitish expectoration; dyspnoea quite severe at times. Decubitus most comfortable on left side. Now general pains much less; other symptoms nearly the same. Appetite poor. Tongue moist, coated. Bowels regular. Sleeps poorly. Dulness on percussion over left front below fourth intercostal space, with faint respiration. Dulness over left back below angle of scapula, with faint respiration. Loud friction rub all over left front above fourth intercostal space. Vocal fremitus absent in left side. Respiration puerile on right side.

R. Spt. ætheris nitrosi, 3 ss.
Tr. opii camphoratæ, 3 ss.
Syr. tolutani, 3 i.

Sig. To be taken every two hours.

Apply jacket poultice to chest. Dover's powder, p.r.n. Skin hot. Temperature, 101° to 103.4°. Pulse full, 110 to 140. Respiration about 50. Dyspnœa increased. Tongue became dry and red. Sputa viscid, brownish, not profuse.

March 18th. The patient was aspirated, and forty-three ounces of serum drawn. Ordered seven ounces of whiskey per day.

March 19th. Had a slight attack of hæmoptysis. Thence he gradually improved until the 29th, when the jacket poultice was replaced by a cotton jacket, and tincture of iodine was applied over left side of chest.

April 3d. Dulness extended a little beyond the median line. Heart beat half an inch beyond median line towards right side. Left side of chest measured half an inch more than right in circumference.

April 4th, he was again aspirated, and thirty-two ounces of sero-purulent fluid drawn.

April 10th. Local anæsthesia was procured by means of ether spray, and a permanent opening made just below the angle of the left scapula into the cavity of the pleura, from which flowed thirty-seven ounces of pus, with many semi-solid bodies in it. A soft-rubber catheter was inserted, and a drainage-tube attached, leading underneath carbolized water in bottle, 1 part to 45. Cavity to be washed twice a day with carbolized water, 1 part to 80. Temperature fell to nearly normal, but pulse remained very rapid. Gained a good appetite, and, generally, symptoms were all greatly improved. Discharge gradually grew less; contained a large amount of coagulable matter, which often obstructed the tube.

May 11th. The wash of carbolic acid was omitted, and one of sulphate of quinidia, ten grains to the ounce, substituted. Patient was up around ward for some time, and at this time went out of doors.

Early in June, on several days, there were small amounts

of blood discharged from the tube. Urine examined and found to be normal. Stimulants were reduced in quantity, and brandy substituted; the first recipe was omitted.

June 17th. The wash of carbolic acid was resumed, the quinidia not seeming to have been an improvement. Temperature was quite normal, and pulse from 90 to 100 per minute.

July 21st. Vesicular respiration was heard at base of left lung, though very faintly over lower two-thirds of left back; resonance on percussion was modified, though not decidedly dull at any part except at the base. Stimulants were omitted.

Sept. 11th. The washing out of the chest was discontinued, and it was found to discharge two to three ounces of thin purulent fluid.

The washing was resumed on the 19th.

The general condition and appetite of the patient continued excellent, yet the discharge somewhat increased, and on Nov. 12th the strength of the carbolic wash was doubled for a few days, and on the 18th the following was ordered as a wash:—

R. Tinct. iodinii comp., ℥ i.

Aquæ, ℥ viii.

Nov. 25th. Physical examination showed right side of chest to be round and normal in appearance, while left was much flattened. Good respiration behind and in front as low as permanent opening. The patient was discharged relieved.

CASE XVI. — Alex. S., 29, currier, born in England, entered hospital March 14, 1876. Mother died of consumption. His own health usually good. Four weeks ago was attacked with cough, with no expectoration, "stitch" in left side, headache and dyspnoea. Decubitus most comfortable on right side from first. Pain in left side was increased for time, but two weeks ago entirely disappeared. Three weeks ago had pain in right side, which has continued to the present time. Tongue coated; bowels regular; appetite

good; sleeps poorly. Dulness in right front to fourth rib; below, flatness. Bronchial respiration to fourth rib; below, bronchial in character, but very faint. Back, dulness on percussion to middle of scapula, with fair respiration; below, flatness, with very faint respiration. Respiration puerile on left side. Apex of heart in fifth intercostal space, below the nipple. Pulse, 88 to 96; respiration, 25 to 32; temperature, 100° to 101.5° . Tincture of iodine was applied over whole right side.

R. Spt. ætheris nitrosi,
Tincturæ opii camph., āā, ʒ ss.
Syr. tolutani, ʒ i.

Sig. To be taken every two hours.

March 21st. Right side of chest was aspirated, and sixty-three ounces of clear serum drawn.

Recipe was omitted, and on the 25th three grains of carbonate of ammonia were ordered every hour. Temperature had risen to 104° . Respiration, 35 to 45; and pulse, 100 to 120. Complained of pain in right shoulder. Opiates, p.r.n. Dyspnœa had become severe, and on April 5th the right side of the chest was again aspirated, and eight ounces of thin purulent fluid drawn. Whiskey, six ounces per day. Omit carbonate of ammonia.

April 9th. Local anæsthesia was produced by ether spray, and a permanent opening made about one and a half inches below angle of right scapula, between sixth and seventh ribs, from which one gallon of purulent fluid was withdrawn. A soft-rubber tube inserted and attached to another one running into a bottle containing carbolized water, 1 part to 45. Cavity washed out with water and carbolic acid, 1 part to 80. Afterward, the patient could lie on either side, and appetite rapidly improved. Several ounces of pus flowed from wound every day.

April 11th. The wash of carbolic acid was omitted, and one of sulphate of quinidia, ten grains to the ounce, substituted.

April 12th. The patient began to have a chill every morning about 11 A. M., and was ordered:—

R. Tr. cinchonæ co., $\frac{3}{4}$ ss.
Quinidiæ sulph., gr. viii.

about 6 A. M.

This caused vomiting, besides stoppage of chills, and on the 21st it was omitted. Appetite slowly improved, and discharge became somewhat less. Brandy, three ounces, was substituted for whiskey.

May 5th. Patient complained of pain at left base, in front, and abundance of fine mucous rales were found there. Brandy increased to six ounces per day. Patient has table-spoonful of extract of malt with meals.

On the 24th of May the injection of carbolic acid was omitted and the following was substituted ;—

R. Potassii iodidi, gr. xxx.
Iodinii, gr. x.
Aquæ, $\frac{3}{4}$ viii.

Five days later the feet and legs were swollen and œdematous. Injection of iodine was omitted, and that of quinidia resumed. A teaspoonful Liebig's extract of beef, with five grains of bicarbonate of soda, was given three times a day.

June 7th. The urine was found to contain a trace of albumen, otherwise about normal.

June 10th. The right hand was swollen and œdematous, and somewhat painful.

June 19th. The carbolic wash was again resumed. General condition good.

July 3d. All former medicine was omitted, and he was ordered two drachms each of whiskey and cod-liver oil, and five grains of citrate of iron and quinine, three times a day.

July 13th. The respiratory murmur was good, as low as the angle of the scapula. The pleura at cavity holds five ounces.

July 30th. Vesicular respiration was heard all over left back, though much diminished at the base. Purulent discharge from one to two ounces in twenty-four hours.

Patient remained about the same until Jan. 1st; had some dyspepsia, for which he was given appropriate remedies. He also had more or less œdema of the feet and hands. He tried tincture of squills and digitalis with compound tincture of ammonia; but they produced nausea, and were omitted, and he was given tincture of chloride of iron.

Jan. 1st. The syringing of the cavity was omitted, and the side dressed with carbolized oakum under carbolic spray. Secretion before had been about two ounces in twenty-four hours.

Jan. 6th. Patient reported that he was chilly when out of bed. Discharge apparently not influenced by treatment. Urine is scanty. To take two ounces of gin per day.

Feb. 7th. Patient still in hospital, and improving slowly.

CASE XVII. — Bridget B., aged 16, domestic, born in Ireland, entered hospital March 27th, 1876. Family history good. Had never been sick before. Entered hospital on sixth day of pneumonia. Progressed well until time for convalescence, when pulse, temperature and respiration remained high instead of usual defervescence. Albumen appeared in urine. April 7th, physical examination showed considerable tenderness on percussion over left front. Cardiac dulness carried to right; expiration prolonged without being bronchial; left back dull, respiration being almost absent at lower part and broncho-vesicular above. Pulse, 105 to 125; respiration, 40 to 45; temperature, 101.5° to 102° .

April 15th and 20th the left side of chest was aspirated and a few ounces of pus drawn each time.

Discharged at own request on April 22d. Returned May 3d, when dulness was found all over the left side; respiration to lower angle of scapula. Ten grains of tartrate of iron and potash were given three times a day, and aromatic sulphuric acid for night-sweats; six ounces of sherry per day.

June 23d. The left side was aspirated and thirty-two ounces of laudable pus obtained, producing considerable relief.

July 4th. Respiration was found absent below line two inches below spine of left scapula. Abundance of mucous rales above. Dulness all over back. Front, vesicular respiration at apex; bronchial below.

July 8th. The patient was etherized and a permanent opening made between eighth and ninth ribs, left side, and forty-two ounces of laudable pus obtained. The cavity was well washed out with carbolized water and a flexible catheter and drainage-tube inserted. All instruments and sponges had been washed in carbolic acid before being used. Cavity to be washed out twice a day with carbolized water, two grains to the ounce, and three grains of quinine three times a day were ordered. Symptoms gradually improved.

Had chill on the 27th, with temporary increase of pulse and temperature.

First appearance of catamenia on Aug. 6th. Discharge gradually grew less, and patient stronger. Goes downstairs; is about most of the time. Appetite good.

Catamenia again appeared on 31st.

Sept. 6th the aromatic sulphuric acid was omitted.

On the 13th had a slight attack of diarrhœa, which was soon relieved.

By the 24th the discharge had become very small, and cavity held very little; tube was removed, and a compress applied to side. Patient has gained in flesh; and looks and feels well. Discharge entirely ceased, and wound closed.

Patient was discharged well on Sept. 30th.

Soon after, she returned to Ireland, and a recent letter, Jan. 1st, 1877, says she is entirely well.

CASE XVIII. — Michael O'D., aged 19, laborer, entered hospital July 11th. Family history good. General health always good. Four months ago was attacked with headache; fever, cough, and sharp pain in left side of chest. Chest enlarged near base of lungs, and breathing become difficult. Chest was opened in April, and there has since been a discharge from wound. Relief followed the operation. Cough not troublesome at present. Sputa purulent, not profuse. No pain in chest. Appetite good. Bowels regular. Sleeps well. Pulse, 108 to 120; temperature, 98° to 101.4°. The discharge was found to be very slight. Probe passes one and one-fourth inches, and detects no cavity. Wound dressed with carbolized sponge. Ordered cod-liver oil, two drachms;

quinine, two grains; and tincture of chloride of iron, twenty drops, three times a day. No respiration in left side of chest, except just below the clavicle. Left side of chest one and one-eighth inches less in circumference than right. Cough became somewhat more troublesome. Discharge about one drachm in twenty-four hours.

By Aug. 1st respiration had become indistinct throughout left side of chest, with subcrepitant rales. Patient sits up.

By Aug. 15th subcrepitant rales were heard throughout left side of chest. Cough troublesome, but general condition steadily improving.

Sept. 11th. Vesicular respiration is heard in left back as low as angle of scapula; vocal resonance nearly to base of left back; dulness over lower half of left side of chest. No discharge for last three weeks from opening in chest.

Discharged.

CASE XIX. — David B., born in Scotland, aged 41, married, a salesman by occupation, entered the City Hospital January 11th, 1877. His health had always been good until four and a half years ago, when he had an attack of empyema, affecting the right chest. By aspiration, thirty-six ounces of laudable pus were removed. The chest filling again, in about six weeks, a permanent opening was made, high up in the axillary line, between the fifth and sixth ribs. At the time of making the permanent opening, twenty-four ounces of pus were removed. No drainage tube was worn constantly, but once daily, by means of a silver tube, the patient drew off the pus which was secreted, and washed out the pleural cavity with a solution of carbolic acid in water. The amount discharged daily for about a year was eight ounces. At the end of this time the patient, on taking a trip out of the State, plugged the opening firmly, in the hope of ending the whole trouble. On his return, so much discomfort was experienced, one week after closing the opening, that he removed the plug. A large amount of pus, not measured, was discharged, and the patient resumed washing out the chest; this was continued about twice a week until he entered the hospital.

January 18th. After the skin had been frozen locally with a mixture of salt and ice, the aspirator was used, the needle being entered about two inches below the inferior angle of the scapula, with negative results.

January 26th. The patient having been etherized, the aspirator was again used, and the needle having been introduced deeply, two-thirds of its entire length, pus was reached. A trocar and canula were passed in the track of the needle and a permanent opening made. About fourteen ounces of reddish sero-purulent matter were obtained. The opening thus made was about two inches below the inferior angle of the scapula, between the eighth and ninth ribs.

On the following day, January 27th, after an attempt to introduce a silver tube, the use of a flexible rubber tube, to be worn constantly, was decided upon. The discharges pass into a sponge, disinfected with carbolic acid, and secured by a bandage around the body.

During the first three days from two to three ounces of pus were discharged. Subsequently the discharge diminished steadily in amount, and at present, February 14th, only about three drachms escape daily, with a fair prospect that it will soon cease entirely. Meanwhile, the patient is up, dressed, and about the ward; he walks about the grounds on sunny days, enjoying good health, and suffering no pain or inconvenience from the tube.

This patient positively declined to have the opening made without ether, stating that he had taken it frequently without injury. It was administered carefully, and in very moderate quantity, sufficient only to dull his sensibility. No injurious effect followed. It will be noticed that several of the cases were etherized, and without evil effect, but after the death of one following suspiciously soon after its use, we have been very reluctant to give it, and do not do so without special reasons. My own feeling on the subject is, that where any considerable amount of disease exists, rendering a large part of the breathing apparatus unfit for use, anæsthetics of any kind are unsafe. I do not admit the necessity for their use in this operation, except in very rare cases. Local anæsthesia will generally be found sufficient;

and, however small the danger attending the administration of the safest anæsthetic, we are not justified in incurring risk, however slight, of fatal results.

With reference to the treatment of the thoracic cavity after the permanent opening was established, it will be observed that in the early cases the practice of syringing or washing with warm water and some disinfectant, was very generally followed. This has become modified by experience to a considerable extent, and is now not generally resorted to unless the discharge is, or becomes offensive; or it is deemed advisable to endeavor, by the use of astringents, to diminish or arrest it.

	DURATION OF DISEASE AFTER PERMANENT OPENING TO DATE OF DISCHARGE.	RESULT.
n water.	Six weeks.	Well.
chlorinated soda.	Thirty-five days.	Well.
ce daily.	Five days.	Died from causes entirely disconnected from operation or disease.
ice daily, for a l, carbolic acid,	Fifty-nine days.	Well. Recovered at home.
f carbolic acid,	Forty-four days.	Well.
nce daily with bolic acid.	Discharge ceased and wound closed in forty- eight days; in hospital two months longer.	Well.
or one month; ated soda and	Eighty-nine days.	Much relieved.
part of the time.	One hundred and fourteen days.	Well.
ened by trocar, r until death.	Thirty-nine days.	Died.
ice daily for a	Forty-nine days.	Well.
ized water.	Thirty-two days.	Died.
of carbolic acid.	One hundred and seventy days.	Died.
twice a day.	Eighty-three days.	Relieved.
e acid, quinine	Six months.	Well.
on of carbolic n, and, lastly,	Two hundred and twenty-nine days.	Relieved.
lic acid, quin-	Three hundred and fourteen days. Still in hospital.	Much relieved. Slowly improving, Feb. 14.
vice daily.	Eighty-four days.	Well.
t sponge.	One hundred and nineteen days.	Well of empyema.
water for one g was made; ge.	Four years and six months to second opening. Three weeks since second opening was made.	Rapidly improving.

RECAPITULATION.

No.	NAME.	AGE.	DISEASE WHICH PRECEDED EMPYEMA.	TAPPED BEFORE PERMANENT OPENING, WITH RESULT.	DURATION OF DISEASE BEFORE PERMANENT OPENING.	CHARACTER OF Pus.	TREATMENT.	DURATION OF DISEASE AFTER PERMANENT OPENING TO DATE OF DISCHARGE.	RESULT.
1	S. B.	15	Pneumonia.	None.	Four and one-half months.	Slightly fetid; acid odor.	Cavity washed out twice daily with warm water.	Six weeks.	Well.
2	H. K.	28	Pleurisy.	None.	Two and one-half months.	Very offensive.	Cavity washed out with warm water and chlorinated soda.	Thirty-five days.	Well.
3	A. P.	23	Pleurisy.	None.	Five months.	Not noted.	Cavity washed out with warm water twice daily.	Five days.	Died from causes entirely disconnected from operation or disease.
4	J. A. H.		Pleurisy.	Four times; serum.	Fifty-five days.	Not noted.	Cavity washed out with warm water twice daily, for a time; later, with weak solutions of chloral, carbolic acid, and salicylic acid.	Fifty-nine days.	Well. Recovered at home.
5	J. D.		Pleurisy.	Four times; serum once; pus three times.	Seven months.	Not noted.	Cavity washed out with weak solution of carbolic acid, twice daily.	Forty-four days.	Well.
6	M. D.	25	Empyema when tapped.	Once; pus.	Three months.	Laudable at first; offensive later.	Cavity not washed for month; then once daily with warm water, and lastly with solution of carbolic acid.	Discharge ceased and wound closed in forty-eight days; in hospital two months longer.	Well.
7	P. W.	8	Pleurisy.	Once; pus.	Three and one-half months.	Not offensive.	Cavity washed out with warm water for one month; after this, with weak solutions of chlorinated soda and carbolic acid.	Eighty-nine days.	Much relieved.
8	J. L.	9	Pleurisy. (?)	None.	Five and one half months.		Cavity not washed out. Poultice externally part of the time.	One hundred and fourteen days.	Well.
9	D. M.	50	Pleurisy.	Seven times; serum twice; pus five times.	Four and one-half months.	Laudable; became offensive.	Poultice externally. Wound closed; opened by trocar, and cavity washed out with carbolized water until death.	Thirty-nine days.	Died.
10	S. C.	28	Empyema at first.	Once; pus.	Six weeks.	Laudable.	Cavity washed out with warm water twice daily for a month; after this once daily.	Forty-nine days.	Well.
11	W. H.	26	Pleurisy.	Serum twice; pus once.	Three months.	Laudable.	Cavity syringed out once daily with carbolized water.	Thirty-two days.	Died.
12	G. H. G.	27	Phthisis. (?)	Seven times; fetid pus.	Thirteen months.	Fetid.	Cavity washed out twice daily with solution of carbolic acid.	One hundred and seventy days.	Died.
13	C. M.	19	Typhoid fever.	Once; pus.	Sixty-four days.	Offensive.	Cavity washed out with carbolized water twice a day.	Eighty-three days.	Relieved.
14	F. S.	28	Unknown.	None.	Five months.	Laudable.	Cavity washed out with solutions of carbolic acid, quinine and quindia.	Six months.	Well.
15	J. K.	34	Pleurisy.	Serum once; sero-purulent fluid once.	Thirty-seven days.	Laudable.	Cavity washed out twice a day with solution of carbolic acid for a month; after, by quindia solution, and, lastly, by carbolic acid.	Two hundred and twenty-nine days.	Relieved.
16	A. S.	29	Pleurisy.	Serum once; pus once.	Fifty two days.	Laudable.	Cavity washed out with solution of carbolic acid, quindia, iodine and iodide of potassium.	Three hundred and fourteen days. Still in hospital.	Much relieved. Slowly improving, Feb. 14.
17	B. B.	16	Pneumonia.	Three times; pus.	One hundred and nine days.	Laudable.	Cavity washed out with carbolized water twice daily.	Eighty-four days.	Well.
18	M. O'D.	19	Unknown.	None.	One month.	Unknown.	Opening dressed externally with carbolized sponge.	One hundred and nineteen days.	Well of empyema.
19	D. B.		Unknown.	Once; pus.	Three months.		Cavity washed out daily with carbolized water for one year; then twice weekly till second opening was made; then dressed externally with carbolized sponge.	Four years and six months to second opening. Three weeks since second opening was made.	Rapidly improving.

UNUSUAL OPERATIONS ON THE GENITAL ORGANS.

By DAVID W. CHEEVER, M. D.

CASE I. — A young man, while straddling over a revolving winch driven by steam-power, entangled it in his trowsers. His clothes were stripped off, and, with them, the left testis was torn off entirely; the whole skin of the scrotum and of the penis was detached from the pubes down to the inner mucous fold of the foreskin, which hung over the glans penis. The right testis, wholly denuded, hung from the uncovered spermatic cord. There was no hemorrhage, but great shock. The latter was as severe as we see after a crushed thigh. The body of the penis, the glans and the urethra, were uninjured.

Operation. — After the patient had rallied, a large flap of skin was taken from the right thigh, and the testis enfolded in it, the edges being secured by wire sutures. The mucous lining of the prepuce was retracted over the glans, and made to cover one-third of the penis. The wound of the thigh was subsequently grafted. The testicle lived, and became securely pocketed in the skin. The penis granulated and cicatrized. All the wounds closed. During the healing process painful erections were a nightly source of great suffering; in the end, however, they were probably sanative, as they kept the penis stretched, and prevented contractions. There was never any trouble from the urethra. The patient left the hospital tolerably restored.

CASE II. — A young, healthy man was found by the police, one cold morning, having lain out all night, exposed. He was intoxicated, and, it is supposed, after urinating, was too

drowsy to cover up his genitals, as he was found in a stupid sleep, with the scrotum and penis bare and frost-bitten. The penis was only vesicated, but the scrotum and perineum were more deeply frozen, and these parts sloughed. The testes became wholly denuded, and hung out by the cords, without a septum, or a back or front covering of skin. The bulb of the penis and the perineum, down to the anus, was wholly denuded, also. The urethra was not affected. The testes hung out like pears from their stems, granulating, but unable to cicatrize. There was no point for skin to start from, except the root of the cord.

Operation. — Skin was dissected up from the inside of the thighs and buttocks, to cover the perineum. The testes were pocketed under the skin of the groins, on either side, as described in Case I. It took about three months to have them and the perineum securely covered in. The patient looked like a double cryptorchid. He left the hospital quite comfortable.

In both these cases the testes grew soft, and, probably, atrophied somewhat. Whether or not they retained their functions we have no subsequent history to inform us. There would seem to be no good reason why they should not, for they rested easily in their new beds, and the cords were lax, and not compressed. Even if they atrophied, as regards future use, the effect on the patient's mind would be much better than after the operation of double castration.

So far as we know, these cases are unique as to treatment.

A PLASTIC OPERATION FOR RUPTURED PERINEUM.

Mrs. —, 37 years of age, bore her first child ten years ago. The labor was short and easy, as she says. The perineum, however, was so extensively ruptured that she lost control of the sphincter ani. This condition has existed ever since. Four years after the birth of the first child, or six years ago, she was operated on for rupture of the perineum. The operation wholly failed of success. About five years later, or fourteen months ago, she bore her second child.

This made things, if possible, worse than before. Total and constant incontinence of fæces had made her a mere wreck in body, and almost so in mind. Following the birth of the last child, the womb fell down towards the dilated outlet, and added to her troubles. There has, however, never been any trouble about the bladder. She is now thin, pale, bloodless; on examination, the vulva is anæmic, and the labia majora so atrophied that the sides of the vulva cannot be brought into contact by pressure or position. The sphincters are torn through and wasted. The rectum is patent, and leaking its contents. It is evident that there is not only a bad tear, but a great loss of substance, increased by an unsuccessful operation which pared away some tissue, by a second childbirth, and by ten years of fæcal drainage, and non-use of the sphincters of the rectum, or vagina. The mucous membrane is as pale as the skin, — smooth, thin, shining. There is a total want of tone, or contractility, about the vulva. Since the sides of the wasted fissure cannot be pared and held in contact by the ordinary deep sutures, — quilled or others, — it is obvious that some different expedient must be resorted to, if we try to close the gap.

Operation. — February 12th, 1873. The rectum having been thoroughly washed out, the patient was etherized and placed in the lithotomy position. I decided to try to close the fissure by two flaps, opposed by their raw surfaces, very much as is done by Mr. Holmes and Mr. John Wood, in their very ingenious operations to cover in exstrophy of the bladder. On the patient's right side of the vulva a triangular flap of skin and mucous membrane was dissected up. The apex of the flap was outside the mucous membrane, in the skin of the thigh. The body of the flap included a large piece of the mucous surface of the right of the labia majora, and the broad base, or root, of the flap was on the inner right wall of the vagina.

On the patient's left side a flap of similar shape and size was made, but with this difference: the apex of the flap was made far inside the left wall of the vagina. The body of the flap included the left of the labia majora, with mucous mem-

brane and skin; and the base, or root, of the flap was on the skin of the left thigh.

The right (patient's right) flap was now turned inside out, and the raw surface looked toward the operator. The apex was thus carried over to the left side of the vulva. The left (patient's left) flap was lifted up by its apex, drawn out at right angles on its root, and thus, its cutaneous surface being toward the operator, the apex was carried over to the right side of the vulva. Now the right flap was undermost and the left flap was uppermost. The two raw surfaces were in contact. The surface looking toward the interior of the vagina, and the surface looking externally and forming the perineum, were both composed of sound skin and mucous membrane.

It will thus be plain, on simple mechanical principles, that one-half of each flap, joined raw surface to raw surface, would form a double bridge, or septum, uniting the two sides of the vulva without any tension. The right apex is fastened up on the left side, the left apex on the right side; and the ellipse of the vulva is restored by the curve between them. The perineum is built up of the double flaps.

The flaps were secured to the sides of the vulva and to each other by silver-wire sutures. Some of the ends were left in the vagina, but the most of them were outside. Finally, the vaginal surface of the rectal wall was pared and sewed up to the raw lower edges of the two flaps, and the vagina thus closed in. A compress wet with cold water was laid on the perineum. The knees were tied together. The bowels were kept under the influence of opium. The catheter was passed every six hours. The vagina was syringed out twice daily with a weak solution of chloride of soda, and the bottom of the vagina was emptied with a siphon. The patient exhibited great fortitude in lying still, and in maintaining a spare diet. Her pains were relieved by opium.

February 17th. There was a good deal of sanious discharge from the vagina, somewhat offensive.

February 19th. One week after the operation. Most of the wire sutures were taken out.

February 23d. There is a good adhesion of flaps, and a

thick bridge is established across the lower half of the vulva.

February 26th. Two weeks after operation. The bowels moved for first time with castor oil and injections of warm olive oil.

March 1st. The cross flaps are firmly established. The rectum has separated from the flaps at the right side, leaving an opening of about one-third the width of the vulva. A second operation was done to close this opening. This resulted well; the surrounding tissues all shrank in, and there was finally left a fistulous opening in the new perineum near the anus, at the right corner, through which a small quill could be passed.

March 22d. Patient has control of bowels; her dejections are natural, and she passes urine. There is no vaginal discharge. The perineum is firm and thick. The anus is puckered up and adherent to the flaps. The patient was now anxious to go home, and, as the little opening at the bottom of the vagina gave no inconvenience, and would evidently shrink more, she was allowed to go. The vaginal orifice was smaller than natural.

In the July following, three months later, the patient reported perfect control of the bowels, and no trouble at the seat of the operation.

ATRESIA VAGINÆ.

In the first volume of the City Hospital Reports we narrated the details of an operation for absence of the vagina. This proved fatal from perforation of the peritoneum, the uterus being so rudimentary and malformed as to have no os, cavity or fundus, but only two nodules on either side of the true centre of the organ.

In the present case the patient was nineteen years of age. She was tall and well formed. The breasts were fairly developed. The outlines of the body were feminine. The vulva was normal. The mons veneris was covered with hair. The urethra and bladder were natural, as was the rectum also. The vagina was just one inch and a half deep, and

ended in a blind pouch. Nothing could be felt beyond it. With a catheter in the bladder and the finger in the rectum, the instrument and finger touched each other, and it could be demonstrated that the walls of the bladder and rectum were in contact, above the vaginal *cul-de-sac*. A tumor could be felt by the rectum, about in the site of a normal uterus and of twice the size. It could not be reached by the vagina. It was pear-shaped, but not fluctuating. It suggested the idea of a distended and hypertrophied uterus.

The patient had never menstruated; only since a few months had she felt a menstrual *nisus*. During the two previous months she had had pains and constant vomiting, and had been failing in health, and growing anæmic.

Convinced that unless relief could be afforded by a normal menstruation she must gradually sink from the violence of the fruitless efforts nature was making, both she and her friends desired an operation, with all its risks. The very fact of so strong and protracted a menstrual effort led me to the belief that the ovaries and uterus were probably normal, and that the difficulty lay in the occluded vagina. Could this obstruction be overcome safely, and a passage opened for at least two and a half inches between the bladder and the rectum, and thence to the cavity of the uterus, without wounding the viscera, or the peritoneum?

The operation was undertaken September 23d, 1873. The patient was etherized, and placed upon her back, in the lithotomy position. The bladder and rectum were thoroughly evacuated. A catheter in the former, and the finger in the latter, served as guides for the knife. A curved, horizontal incision was made at the top of the vaginal pouch. After penetrating through the mucous membrane, a tough, cicatricial structure was reached. This having been passed through, a loose cellular interspace was found. Progress was now made by dilating and tearing, with a blunt director and with the finger. In this way the cavity was gradually deepened, and occasionally a touch of the knife had to be used to free a stronger adhesion of fibrous tissue. It was very difficult to avoid piercing the bladder, or the rectum, whose walls bulged up above and below, until they met,

like two partly filled sacs. Once the rectum was perforated down to its mucous coat. The tumor in the rectum was too high to be forced down so as to be appreciated in the vaginal wound. Neither did pressure over the pubes make it descend. After reaching a depth of about three and a half inches from the vulva, in deepening the cavity with the knife, a thick, sago-like, whitish fluid, was noticed extruding from a minute puncture. A director, being passed in at this point, penetrated into a large cavity. The opening was enlarged with the knife, and a rush of fluid resembling gruel followed. A free opening was now made, and the finger being passed in swept about in a large cavity whose only boundaries were the walls of the pelvis. There was no feeling of a uterine sac-wall. Altogether from eight to twelve ounces of thick fluid escaped, and the cavity was then syringed out with warm water. Dilators and retractors having well stretched the orifice of the sac at the top of the vaginal wound, a large glass speculum was passed in. To our great satisfaction, well formed, but quite small, cervix and os uteri were to be seen at the top of the sac. The finger could not reach the uterus. A probe passed a little way into the cervix. No fluid exuded from it.

The wound was now packed with sponges. The bleeding was very trifling. Subsequent treatment was directed to cleanse the cavity, and to keep the new vagina dilated. For several weeks large rectal bougies and glass specula were used daily. After a month these were passed about once a week.

The patient shortly improved in health. Vomiting ceased from the day of the operation. In three months she gained twelve pounds in weight. She lost her anæmic and waxy look, and grew more developed and strong.

In January, less than four months after the operation, she menstruated. She has since done so, regularly, every month.

In one year subsequently she was married, and continued well. It remains to be seen, if she should become pregnant, whether the uterine forces could safely dilate the partly cicatricial vaginal walls.

ON CERTAIN DISEASES OF THE NERVOUS CENTRES.

BY ROBERT T. EDES, M.D.

I. INTRA-CRANIAL SYPHILIS.

Syphilitic intra-cranial manifestations may be conveniently referred to three classes, as stated by Heubner :—

1. New formations.
2. Meningitis.
3. Cases in which symptoms occur without obvious lesions.

It appears, however, that the meningitis is really the remains of, or connected with, a diffused new formation, while in the cases in which no lesions have been found, the reason has been that they were not properly, *i. e.*, microscopically, examined.

The new formations usually originate either in the dura mater at the base of the brain, in the subarachnoid space, or in the walls of the arteries supplying the brain with blood. Undoubted cases of syphilitic tumors in the *interior* of the *brain*, unconnected with the membranes, are exceedingly rare, if, indeed, they exist at all.

Syphilitic growths, however, do not always take the shape of a more or less distinctly circumscribed tumor ; they may assume the form of a diffuse infiltration, which, when it has passed the stage of a gray gelatinous exudation, not unlike that of tubercular meningitis, becomes a fibrous or cicatricial structure ; this then looks like the remains of a simple pachymeningitis, an ordinary non-specific chronic inflammation of the dura mater.

In some cases the arteries at the base of the brain, with their branches, are affected by a thickening, which may re-

duce their calibre to a small fraction of the normal, or even render them impermeable. When the thickening, however, leaves a small opening, their complete occlusion may be brought about by a clot. This thickening appears as a yellowish-white, opaque patch, occupying a part or the whole of the circumference of the artery and a fraction of an inch in length. The walls become thicker and stiffer; and the artery when cut across remains sound and firm. Heubner describes the new formation as occupying the internal layer of the arterial coat. In the case I have figured, which was observed and described before I was aware of Heubner's observations, there was also a layer of small cells *outside* the muscular coat. This condition of the arteries plays a very important part in the production of symptoms, especially of those of a convulsive and paroxysmal character. It is not, however, as was at first supposed, characteristic of syphilis, a similar structure having been observed in non-syphilitic cerebral arteries, in phthisical lungs, in tumors, and in ligatured arteries, forming the so-called "organization of thrombi." This is the process by which the ductus arteriosus and the umbilical arteries are closed after birth.

The diagnosis of cerebral syphilis is not to be made by any pathognomonic symptom, or group of symptoms, since there is no such. The seat and the nature of the lesions differing so widely, it is easily conceivable that the symptoms may put on the most various characters, and appear in all sorts of combinations. Among the early symptoms, however, and present in most cases, is headache, often exacerbating, like other syphilitic pains, at night. This is sometimes intensified by pressure on particular regions, and is in many, if not in all cases, connected with a local lesion, often pericranial. Sleeplessness is another early phenomenon, to which may be added attacks of dizziness, oppression and confusion, shooting pains in the limbs, diminution of memory, slowness of thought and speech, and irritability of temper.

It will be at once perceived that there is nothing distinctive in these symptoms. We may say in general that the diagnosis rests to a considerable extent upon the sudden and unex-

pected occurrence of severe and more or less peculiar symptoms, as well as the regularity of their succession and grouping. A localization is sometimes possible from the affection of various cerebral nerves, but the nature of the growth appears from the progress and history of the case rather than from the special conditions of paralysis which may exist at any given time. In the absence of a syphilitic history the diagnosis, so far as the character of the lesion goes, must often remain a suspicion rather than an opinion; a condition of things that fortunately need not materially influence the treatment, since that which is useful in a cerebral humor arising from syphilis, will, to say the least, do no harm if the growth is of a non-specific character.

Heubner makes the following groups of symptoms as covering a large proportion of cases:—

I. Mental disturbance, with epilepsy, incomplete paralysis (seldom of cerebral nerves), and, finally, a comatose condition, usually of short duration. This group corresponds especially to the presence of syphilitic gummata in the convexity of the hemispheres.

II. Genuine apoplectic attacks, with consequent hemiplegia in connection with a peculiar somnolent condition, returning in repeated attacks; often unilateral irritative symptoms; usually paralysis of the cranial nerves. Here we are more likely to find, after death, the new growth, if present, at the base, but connected with, as explaining the paralysis of the cerebral nerves, a diffusion of the formation in the membranes, a gummatous meningitis. In addition, we find syphilitic arterial disease and its consequences in the form of infarctions, softening, and cysts.

III. A course of the disease resembling general paralysis of the insane. With this form are associated the less-marked lesions, although the microscope would probably show in these cases at least the consequences of repeated congestions of the cerebral cortex.

The period of the disease at which distinctly nervous symptoms (beside the general pains) may make their appearance varies greatly. Facial paralysis, one of the most common forms, may occur even with the exanthematous syphilide

(Lanceraux and others quoted by him), or in one month after the primary affection. In these cases the prognosis is far more favorable.

The more serious affections connected with gummata, softening and arterial diseases are usually of later origin and belong among the late secondary or tertiary symptoms. Cases I., IV., and V. belong to the latter class; case VI. to the former.

CASE I. — Mary D., aged 43, entered City Hospital Sept. 6, 1873. Four years ago she had a bad eruption all over her body, and her hair came out. There is no history of sore throat. Seven months ago an eruption appeared upon her right forearm; this is now present there and on the legs. It is in irregular patches, the skin thickened or covered with scales and crusts. She has also on her legs the cicatrices of ulcers.

A week ago she began to lose the power of her right arm and leg, the arm most. This paralysis has increased. She has noticed that she does not talk so well as she did a week ago. There is some facial paralysis upon the right side, but the tongue is protruded straight. A few days afterward the right pupil was noticed a little larger than the left, though both were sensitive to light. She was put upon large doses of iodide of potassium, to which, on Sept. 5th, one-sixteenth of a grain of bichloride of mercury was added.

Oct. 22d. The patient complained of pain in her right arm. Early in November this disappeared, and there was then pain in the right temple, which went away in a few days.

She improved as regards her paralysis; but the arm was still weak when she left the hospital, on November 24th.

This case was far from being a well-marked one. It differed, however, from ordinary hemiplegia in the somewhat gradual appearance of the paralysis, and the absence of any unconscious attack. The irregularity of the pupils and the localized headache are also to be noticed in reference to the diagnosis. Without the syphilitic history, however, we should have hardly had a satisfactory clue to the probable disposing cause.

CASE II. was a very interesting and instructive one from several points of view. It has been published in full by Dr. Stedman and myself in the *American Journal of the Medical Sciences* for April, 1875, and only a short sketch of it will be given here.

The patient, aged 32, had a probably syphilitic history. Six months ago trouble in chewing on the right side of the jaw was observed, and then pain and numbness on the same side. In October, 1871, on entering hospital, the patient was emaciated. Paralysis of third nerve on right, and neuralgia of fifth, came on. Iodide of potassium in large doses was given.

Sight of right eye nearly disappeared at one time. The paralysis of the third pair diminished. Pains about left eye developed. Dr. Williams found by the ophthalmoscope the retinal veins engorged, arteries small, here and there obscured by exudation; papilla somewhat pushed forward and its outline indistinct. The movements of the eye improved, and the numbness became less.

Dec. 9th. Anæsthesia of the fifth nerve. Right temporal muscle atrophied.

March 12th. Sensation of face normal, but that of eyeball lost.

During the summer the patient was treated as an outpatient for ulcerated cornea of the right eye. Meanwhile he got his life insured.

August 29th. Talks indistinctly and inaccurately. Has been getting worse. Diarrhoea and vomiting. Emaciation.

September. Left facial paralysis. Gradually lost faculties, sensation and motion generally.

Died February, 1873.

The autopsy disclosed small tubercles at the upper portions of the lungs. Thickening and adhesion of the dura mater over the apex of the right temporal lobe, involving the Gasserian ganglion of the fifth pair. The optic chiasm was surrounded with lymph. The arteries of the Sylvian fissure (middle cerebral) were affected in several places with a white thickening, as were also two vessels upon the medulla oblongata, one on each side of the fourth ventricle. The

nervous tissue of the right temporal lobe was softened and degenerated. The Gasserian ganglion was decidedly thickened, as compared with that upon the left side. The arteries displayed upon section, both endarteritis and ectarteritis, as is illustrated by the sketch, which shows the inner coat much thickened by hypertrophy, reducing the calibre of the artery to one-third or one-fourth the normal.

The proliferation of cells upon the outside of the artery is less distinctly a specific lesion than that of the internal coat. In this case, however, there is no reason to doubt its syphilitic origin.

The changes found post-mortem correspond very closely with the symptoms observed. For the loss of sight in the right eye, we have:—

First. The lymph around the optic nerve.

Secondly. The optic neuritis as observed during life. This is an exceedingly important symptom in intra-cranial disease of any kind. Although it gives no indication as to the precise nature of the disease, it raises, especially if double, a strong suspicion of some gross lesion, a tumor, or meningitis. It is, however, not always associated with dimness of vision, but may be discovered almost accidentally.

Thirdly. The opacity of the cornea.

The syphilitic deposit around the Gasserian ganglion undoubtedly gave rise, in its earlier and more active condition, to the irritation and neuralgia observed early in the case, as well as to the paralysis of the motor portion, indicated by difficulty in chewing. Later, when it ceased to proliferate rapidly and became contracted, began the anæsthesia upon the corresponding side of the face, and the atrophy of the temporal muscle. Why the sensation should have returned we cannot definitely say, except that probably some fibres escaped compression sufficiently to have their function restored.

In the diminished supply of blood afforded to the brain by the obstructed arteries, we have, probably, the cause of the gradual failure of mind, sensation and strength. Had they at any time become completely obstructed, we should have

had more distinctly marked symptoms depending upon anæmia, softening or infarction of the brain substance.

CASE III. — THOS. R., aged 25, entered hospital July 22d. 1874. Seven years ago he had a sore upon the prepuce, followed by buboes. Afterwards, he was well until February last, when, one morning, after leaving his bed, his head felt heavy, and he fell upon his back to the floor. After this, his condition was apparently much like that in which he entered the hospital. He was then up and about, with a stupid expression and thick speech; no facial paralysis. His gait was uncertain and irregular. He put his feet down carefully, looked before he stepped, and walked a short distance, when he suddenly staggered to the left, swung about in a curve, and brought up against the wall. Could stand well with his eyes closed, if he kept his chin up and head thrown back; but, when standing in the natural position, he began slowly to sway from side to side, till he fell. In trying to walk with his eyes closed, he stumbled and fell almost immediately. He says that he can't tell when his feet touch the floor, and that, soon, his head feels too heavy for his body, and he has to put out his hands to save himself from falling. He has perfect control over the upper extremities. A dark, scaly eruption is on both legs. Digestive functions normal. Temperature 98.4°. Iodide of potassium, in five-grain doses, three times daily, was prescribed.

July 25th. Face flushed; considerable headache; staggering increased. Leeches and bromide of potassium.

July 26th. Iodide of potassium increased to thirty grains daily.

August 1st. Attack of vertigo and headache, with flushed face. Patient fell to ground suddenly. Leeches and bromide of potassium.

August 6th. Right-sided hemicrania. The iodide of potassium was gradually increased to fifteen, twenty, thirty grains, three times a day.

September 2d. Iodide omitted, and ergot, with strychnia, given.

September 9th. Patient had distress in chest and calves

of legs. Could not walk or balance himself as well as usual. The strychnia was omitted, and bromide of potassium, twenty grains, three times daily, was substituted.

October 2d. Discharged relieved.

He returned to the hospital May 20th, 1875, saying, if I recollect rightly, that he had been nearly or quite well in the interval. The symptoms were essentially the same, but there was a suspicion of malingering. Iodide of potassium was again given, and he was discharged, relieved, June 1. All efforts to trace him further have failed.

This case in some respects resembled one of locomotor ataxia, but certain symptoms inclined us rather to a diagnosis of syphilitic disease, probably of the cerebellum:—

In the first place, the staggering and rotatory movements when walking with the eyes open.

Secondly, the feeling of heaviness and dizziness in the head when the patient tried to stand with his eyes closed.

Thirdly, the flushing of the face and the headache, and general somewhat paroxysmal character of the disease.

CASE IV. — H., a middle-aged man, presented himself with a syphilitic eruption. He had had intense facial neuralgia; when I saw him with Dr. Stedman this was better. He had then an ataxic gait; he could not walk well with his eyes shut. He had also epileptiform attacks. Afterward, his temper became morose and violent. He became almost completely paralyzed, lost his memory, and had other epileptiform attacks. He died early in 1876. For an account of his latter days I am indebted to Dr. C. H. Davis, of Worcester.

CASE V. — Paul F., a young man, seen at Dr. Wadsworth's clinic, gave a syphilitic history; bubo, eruption, sore throat, necrosis of upper part of sternum. He had to give up his occupation as bar-tender because he could not see to make change. Several weeks ago, right facial neuralgia developed, which continues. The patient complains of pain in the right temple. The right eye cannot follow left completely over to left side nor upward. The right pupil is sluggish. The

right disk, at inner and upper part, is somewhat indistinct in outline, possibly some increase of vascularity. Dr. Wadsworth called it suspicious, without actually diagnosing neuritis. Iodide of potassium was prescribed.

A week or two later the paralysis had increased. Right pupil widely dilated. Some pain on right side of face. To have one-sixteenth of a grain of bichloride of mercury three times daily.

Some days later it was found that the patient did not get the whole dose of the iodide, owing to a mistake. There was no improvement. As I have learned from physicians under whose care this patient subsequently came, he became more paralyzed, at one time requiring to be nourished artificially, either by the stomach-tube or by the rectum, on account of inability to swallow. One vocal cord is now paralyzed, but the paralysis of the third pair has diminished, and he is, on the whole, improving. He is using iodide of potassium.

CASE VI. — A. H., aged 26, a painter, reported himself well until five or six weeks before entrance. He has had gonorrhœa, but that is "all that he knows of," except a recent chancre, which has broken out again. Enlarged glands are found in the groin. He was attacked with sharp lancinating pain on the vertex and frontal region, then extending to left side of head. These pains remitted until two weeks before entrance, when they attacked, in addition, the occiput and left ear. The patient entered hospital March 27th. On April 1st there was present a nearly complete facial paralysis upon the left side, which had come on gradually. The *orbicularis palpebrarum* was almost completely paralyzed, and the point of the uvula was turned to the right. The outward excursion of the left eye was very slightly limited. No ptosis nor difference in pupils. There were noises in the left ear. The grasp of the left hand was less powerful than that of the right. A diagnosis of syphilitic paralysis was made, and the lesion located at the base of the brain, upon the left side, involving the facial nerve with the left peduncle of the cerebellum. The patient was treated with large doses of iodide

of potassium, and discharged very greatly improved, and improving. It should be stated that lead was sought for in the urine without success. This patient was again in the Hospital during the winter of 1876-77, with some pain on the left side of the head, but with little or no facial paralysis.

EXPLANATION OF FIGURES.

PLATE I., Fig. 1.—Section of a cerebral artery affected with syphilitic thickening (from CASE II).

- A. Lumen of artery, much narrowed.
- B. Inner coat of artery thickened by proliferation of endothelium. The structure contains many nuclei, around which, in many places, may be seen an oval outline representing a cell.
- C. Muscular layer.
- D. Proliferation of adventitia, extending on each side, into a similar condition of the pia mater.
- E. Cerebral substance, depressed, and perhaps somewhat atrophied in its outer layers, by the pressure of the thickened artery.
- F. Small nutrient vessels of cortex.

II. A CASE OF PARAPLEGIA, FROM A TUMOR COMPRESSING THE SPINAL CORD.

L. G., a negress, aged 25, entered the hospital April 10th, 1874. She had had a still-born child at term, and a miscarriage at four months last winter. Since the previous June (ten months), she had been gradually losing power in her legs, and for the last four weeks had been unable to walk. For three months there had been pains in the back and legs, which had somewhat diminished at time of entrance. Except stiffness of joints and loss of power, she had felt well. Two days before her entrance she had had difficulty in the passage of urine, which, becoming complete retention on the next day, was relieved by the catheter.

At the time of entrance the legs were drawn up and rigid. She was able to extend them slowly and with some pain. She was suffering from retention of urine, which was relieved by catheter. Her bowels were constipated. If her legs were suddenly drawn down, a spasmodic movement in the direction of flexion resulted. This condition gradually passed into complete paralysis. The reaction of the muscles to the galvanic and to the induced current appeared to be normal.

It was difficult to determine with accuracy the condition of sensation. It appeared as if tactile sensibility in the legs were lost for some time before death, while sensibility to pain continued. She constantly reported two points of contact as one, or else answered entirely at random, although she appeared at times to feel a pain from the experiment. On one occasion she reported sensation from the battery current, when none was passing. The above was the condition in the legs and lower part of back. There was no tenderness of the spine, either to pressure or to percussion.

The urine was at times voided involuntarily, as were the fæces toward the last. At other times the catheter had to be used. The urine contained some albumen, with pus and mucus. The left side of the face was partially paralyzed, and at times affected with muscular twitchings. So far as she knew, it had always been so. She gradually failed, becoming weaker, and taking but little food, and passing urine and fæces in bed. She usually lay upon her back, with the mouth open, head somewhat retracted, and much sordes on the teeth. The right leg was strongly flexed, and adducted so as to be thrown over upon the left side. The movements of the hands became weak, but there was never any paralysis of them.

During the last fortnight extensive sloughs formed over the sacrum and trochanters. She died May 30th. The pain was relieved at first by the galvanic current, as it had been before entrance. Iodide of potassium was ordered, but it is probable that she did not take a great deal of it.

Autopsy.—The calvaria was of great thickness. The brain (including the cerebellum) weighed forty ounces. The spinal dura mater presented nothing abnormal before removal, but the pia mater was much congested, the vessels being enlarged and tortuous. The substance of the cord itself, especially the gray matter, was somewhat reddened.

Upon further examination of the dura mater after its removal, a flattened mass was discovered adherent to its anterior surface, and presenting the appearance of having been torn from some portion which probably remained in the spinal canal. Unfortunately, this was not discovered until some

hours after the removal, when a further examination of the anterior wall of the canal, where there was probably another attachment of the tumor, could not well be undertaken. The length of the tumor was about two inches, and its point of greatest thickness, where, of course, the compression of the cord was greatest, was just below the cervical enlargement, so that the tumor may be said to have occupied the lower cervical and upper dorsal regions. Laterally, it did not pass beyond the anterior nerve-roots on the right, and but slightly beyond on the left, where, however, its thickness was considerably greater. Its edges were not distinctly limited.

Upon examination of the nearly fresh specimen, it was found that, in the region of greatest compression, the vessels were fatty, many "granulation cells" present, and occasional masses of pigment. The myeline appeared more broken up than normal. A zone of exudation surrounded some of the vessels.

These changes, especially the fatty, were more marked in the anterior and posterior columns, less in the lateral. These always diminished in degree in both the upward and downward direction.

Upon making sections of the hardened cord, the fatty changes, of course, ceased to be visible, owing to the process of preparation. The most obvious features in the transparent sections were the greatly enlarged and numerous vessels, which were filled with blood. These were seen in all parts of the sections in the affected region, but were especially numerous in the posterior horns of gray matter. In the neighborhood of the point of greatest compression, and especially upon one side (probably the left), the vessels were accompanied by a considerable amount of connective tissue.

The nervous tissue, especially in the anterior columns, was atrophied, the usual concentric circles of myeline around the axis cylinders being either absent or very small, while the axis cylinders themselves were either absent or difficult to detect from the change in their usual relations and the hypertrophy of connective tissue. The anterior portion of the lat-

eral columns had apparently undergone a certain amount of change of the same character, and also the posterior columns. These changes extended but a short distance beyond the point of compression, the lumbar and indeed the middle dorsal region being free even from marked congestion.

The tumor consisted of laminae of dense connective tissue, continuous with that of the dura mater, enclosing masses of medium-sized, oval and irregular nucleated, and a few spindle-shaped, cells.

It is to be regretted that the circumstances of the autopsy prevented an examination of the anterior surface of the tumor, which might have thrown more light upon its origin.

Nothing was found in the medulla oblongata, or facial nerve, to account for the partial facial paralysis.

It is by no means improbable that this tumor was of a syphilitic character, but the historical evidence on this point is scanty.

III. THREE CASES OF SCLEROSIS OF THE POSTERIOR COLUMNS OF THE SPINAL CORD.

Of the following cases of locomotor ataxia, two terminated in the hospital. It is obvious that in a disease running such an exceedingly chronic course, it must be a rare chance which will allow a clinical history from the beginning of the disease to be followed by a careful autopsy. Both of these cases had passed the earlier and more characteristic stage when admitted to the hospital. The lesions discovered were distinctive. The third case, which I am enabled to use by the kindness of Dr. Winsor, of Winchester, Mass., who sent me the specimens, is very complete in its clinical history.

CASE I. — F. A. S., aged 70, entered the hospital September 15th. He had been a moderate drinker; had had gonorrhœa, but not syphilis; was healthy until fifteen years ago; then he began to have attacks of dizziness and staggering while walking, lasting a minute or two. These attacks have gradually increased in frequency since. There was no

loss of power in the legs at any other time until three years ago, since when he has gradually lost power over them, until now he cannot walk alone. Dizziness and staggering are much worse when the eyes are closed. For the last eighteen months he has lost power over the sphincter ani, dejections often taking place without his knowledge. He can retain urine for about three hours; after that time it dribbles away. His mind is not quite so strong as formerly, but he does not think his memory has been affected. He cannot write what he wishes to, "thinks one thing and writes another," but can pronounce words which he desires. He never had pain in the back, except for a few days on re-application of a truss which he had worn for many years and left off for a short time; then the pain was felt on the right side of the lower lumbar vertebræ, and the left leg was partially paralyzed, both in sensation and in motion. On removing the truss the symptoms disappeared. His appetite is good. His tongue is somewhat coated. The bowels are irregular; at present somewhat loose. Sensation is not so acute in the left leg as in the right, but there is decided tactile anæsthesia in both legs. Answers questions readily, but slowly; articulation rather indistinct. No history of anything like "*douleurs fulgurantes*" could be obtained.

After his entrance the patient was at times delirious, attempted to get out of bed, but could not walk. He could stand with his eyes open, but, on closing them, immediately began to tip forward or backward, as happened. He could write slowly, but a very intelligible hand. Electricity (Faradic) and phosphorus was ordered. The muscles re-acted well to the stimulus. He gradually failed in strength and in mental capacity. On Oct. 7th, muttering delirium was noted. When roused, he answered questions. He lay with his eyes half closed and his head retracted. His pupils were much contracted, and did not respond to light. He died on Oct. 9th.

Autopsy.—The dura mater was firmly adherent to the skull. The pia mater was somewhat thickened and finely mottled with whitish opacities, and contained in its meshes about three ounces of serum. The brain substance was

healthy. The dura mater of the spinal cord presented some patches of whitish opacities, resembling those mentioned above. The pia mater was congested and the vessels enlarged, especially upon the posterior surface; it contained, at various places, small porcelain-looking (microscopically fibrous) plates from one fourth of an inch in diameter down, usually more or less oval in outline, with thin edges. These were most abundant in the lower dorsal and upper lumbar region.

The cord itself showed a very marked diminution in size, more evident in the cervical region, where it appeared flattened out, hardly more than one-half or two-thirds its normal size. It looked as if puckered in on its posterior surface. On section, a gelatiniform or semi-translucent look was observed in the posterior columns.

Sections made at various heights, colored and made transparent in the usual manner, showed a certain amount of atrophy of the whole white substance, the sections being compared with others from a normal cord. In the posterior columns, which were the most atrophied, the characteristic lesions of locomotor ataxy, or so-called sclerosis, could be seen, the nervous elements being much diminished in number and the interstitial fibrous tissue increased. In the lumbar region this alteration was chiefly found in a thin layer of the whole posterior surface, from the nerve-roots of one side to those of another, being thickest just internally to the posterior cornua and close beside the posterior fissure. In the dorsal region it extended somewhat deeper, while in the cervical it was chiefly confined to the "wedge-shaped columns of Goll," situated upon each side of the posterior median fissure, and occupying nearly the whole depth of the cord to the posterior commissure, this depth, however, being but about half the normal. Outside the limit of these columns a much less degree of the same alteration was to be seen. It was undoubtedly owing to the extreme atrophy of these centrally situated columns that the cord owed its contracted appearance in the cervical region. The nerve-roots were also atrophied. No corpora amylacea or granular corpuscles were found on ex-

amination of the fresh specimen. The precise height at which the lesion terminated was not made out. No sections were made at the level of the spinal accessory roots, while at the level of the decussation no change could be detected.

No portion of the brain above the pons was examined microscopically. All the other organs were healthy.

CASE II. — G. S., aged 54, a brass-finisher, entered the hospital about the middle of June, 1875. The statements obtained as to the previous history were indefinite and contradictory. That which agreed best with subsequent observations was to the effect that his paralysis came on gradually, lasting ten years, and was supposed by him to be rheumatism. At the time of his entrance to the hospital he could not walk, but could move his legs pretty well in bed. Muscular irritability to the induced current was good. The muscles did not contract upon faradic irritation of the sciatic, but did so to the galvanic current. The patient felt the sponge everywhere, but it pained only when applied above the pelvis. The urine constantly dribbled away, and was afterward found to contain pus and phosphates.

No cerebral symptoms were noticed, except deafness. His condition did not change materially in any respect except that after two or three months he took a few steps with much assistance. Previous bed-sores had progressed toward healing. In November a diagnosis of reflex paraplegia was suggested, and consequent examination disclosed the presence of a prostatic calculus.

He died in December, and an autopsy disclosed a bladder very much contracted and thickened, its inner surface red, rough and granulated. In the prostate was a ragged cavity with sloughy walls, containing two calculi (probably uric acid) and pus. The spinal cord presented gray degeneration of the posterior columns. In the lumbar and lower dorsal regions this lesion occupied the entire space between the posterior horns, extending forward nearly or quite to the commissure. In the cervical region the area of degeneration became narrower, and was confined to a strip close to the median line (wedge-shaped columns of Goll). The

microscope showed in the fresh specimen granulation-cells, amyloid bodies, and some (though not extensive) fatty deposits along the blood-vessels. The fibres appeared much fewer in number than normal.

The lungs were very deeply pigmented, with fibro-calcareous nodules at the apices.

Had the examination of the cord been omitted, the diagnosis of reflex paraplegia would have been apparently fully confirmed by the post-mortem results. Looking at the history, however, in connection with the complete autopsy, it seems highly probable that the ten years of "rheumatism," with gradually increasing paralysis, mean the early stage of progressive locomotor ataxy, which brought the patient to the hospital only after one of the most distinctive features of that disease (the peculiar gait) was no longer available for diagnosis, since he did not attempt to walk until after two or three months. Any minute description by him of the precise nature of his disability was out of the question. The imperfect history also prevented any certainty as to the relation of the vesical and nervous troubles, though it is by no means improbable that the calculus may have been found as the result of the vesical paralysis which frequently forms a part of the disease.

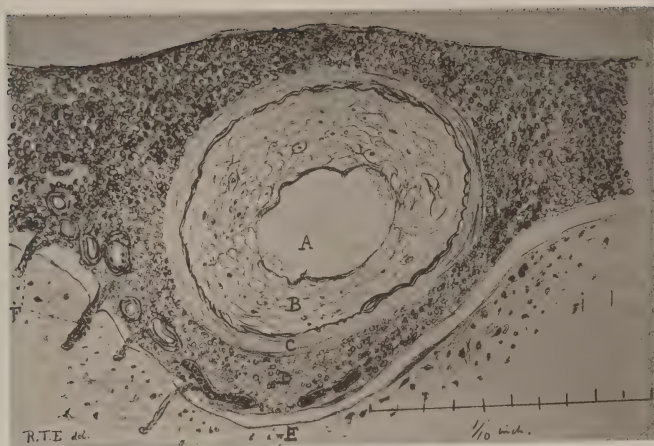
CASE III.* — Mr. A., aged 38 at time of death, dated the beginning of his disease ten years before his death, when he had external strabismus, dimness of vision, and, finally, almost complete loss of vision; recovery was complete in six months (unless the frequent "numbness" of eyes is to be considered a remnant of this). A very quick pulse was probably found as early as this.

A year later the characteristic pains in the feet and legs began, and continued seven and a half years; and coincident with them was incipient paralysis of the bladder.

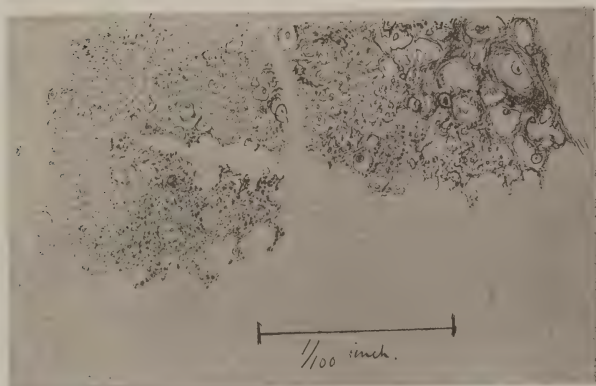
Three years later herpetic eruptions on the thighs, legs and penis, occurred at intervals through three years.

Two or three years later there was great difficulty in

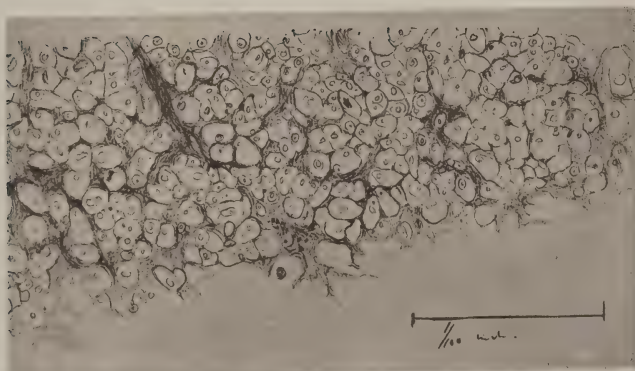
* This case is reported in detail by Dr. Winsor in the "Boston Medical and Surgical Journal," Oct. 6, 1870, p. 213.



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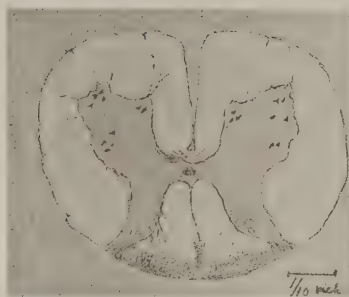


Heliotype.

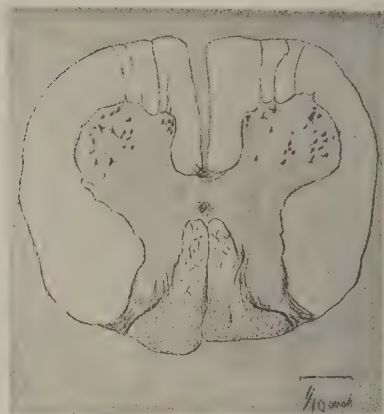
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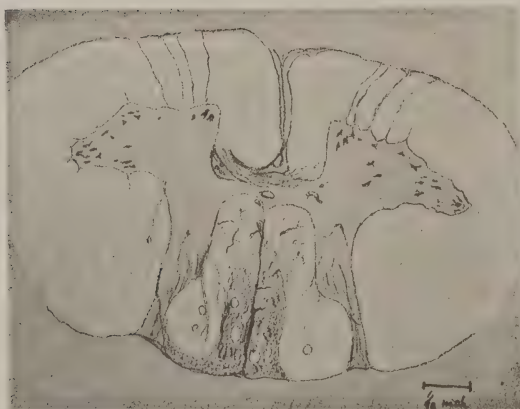
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walking by night, and disordered action of the feet in walking by day.

Three years later (two years before death) pain was less, and localized contractions were observed, beginning in the abdomen and thighs; hæmoptysis occurred.

One year later straddling and clumsy gait, and inability to walk straight across the room, with great wasting, were present.

Seven months before death seminal emissions occurred. Two and a half months before the end the patient had cough, a changed voice, and stupor in the evening; in another fortnight, night sweats; the next week, up to which time he attended steadily to his business, serious disease of right lung, prostration, deafness. In three weeks more, similar diseased action became evident in the left lung, with steady increase of all symptoms, till, in four weeks more, death occurred.

The post-mortem examination disclosed solidification (without miliary tubercle) of both lungs, with nothing of marked interest in other organs.

I received eight or ten inches of the lower end of the cord. On examining the fresh specimen, the posterior portion of the posterior columns presented a shining, semi-transparent appearance, somewhat different from the usual dead-white, though not very marked. The microscope showed this portion to contain vessels in a state of fatty degeneration, and very many granulation-corpuscles. Nothing of the kind was observed elsewhere.

After hardening, sections showed the nerve-tubes in this region to be reduced in number and separated from each other by much more than the normal interval, by granular matter, or hypertrophied connective tissue. The posterior nerve-roots were much atrophied.

EXPLANATION OF FIGURES.

PLATE II., Figs. 1 and 2 (from CASE I.). The darkest-shaded portions show the region invaded by sclerosis. In the lumbar region (Fig. 2) it reaches nearly from one posterior horn to the other antero-posterior, but its depth is less than in the cervical region (Fig. 2), where it occupies the columns of Goll. In Fig. 2 the outline of a section from a normal cord, at about the same level, is drawn outside, in order to show the atrophy which has taken place. The atrophy is noticeable even in comparison with the specimens from CASE II., Figs. 3 and 4.

PLATE II, Figs. 3 and 4 (from CASE II.). The localization of the lesion is nearly the same as in CASE I. The atrophy is much less.

PLATE I, Figs. 2 and 3. Portions of sections from CASE II., more magnified. Fig. 2 normal or nearly so. The sections of nerve-tubes with the contained axes-cylinders are in close opposition, only here and there separated by a small portion of connective tissue. At the edges fragments of connective tissue are seen free from nerve-tubes.

Fig. 3. From a sclerosed portion. Traces of sections of tubes are only here and there visible. The connective tissue has a granular appearance, depending probably on the presence of minute fibres.

COMPOUND FRACTURES.

BY GEORGE W. GAY, M.D.

One hundred and sixty-one cases of compound fracture of the arm, fore-arm, thigh and leg were admitted to the Boston City Hospital during the five years ending June 1st, 1874. Four of the patients were removed by their friends before the result of the case was determined, and will not be considered in the following remarks.

Of the one hundred and fifty-seven complete cases, ninety-two recovered; or 59 per cent. . Sixty-five died; or 41 per cent. The number treated by conservative measures and by amputation was about the same; the mortality rate was forty-four per cent. in the former, and thirty-nine per cent. in the latter.

The severity of many of the injuries is well shown by the fact that thirty-two, or one-half, of the fatal cases terminated within forty-eight hours after entering the hospital.

The fractures were distributed as follows:—

Arm	25 cases
Fore-arm	35 “
Thigh	23 “
Leg	74 “
Total	157 “

Eighty-two cases were treated by conservative measures, and forty-six recovered; or 56 per cent. Seventy-five cases were amputated and forty-six recovered, or 61 per cent.

An attempt has been made in this report to so classify the cases that there shall be as much uniformity in the char-

acter and extent of the injuries in each series as possible. We fail to see any benefit to be derived from comparing patients with a compound fracture of the leg, for instance, with those having, in addition, a like injury to the skull. Hence, in estimating the following percentages, only the uncomplicated cases have been considered.

I. *Arm.* — Of the twenty-five cases of compound fracture of the arm, twenty recovered, and five died. Three of the fatal cases were complicated with other injuries, and died within three days of the accident. In one instance there was a compound fracture of the skull; in another, a compound fracture of the leg; and in the third, a similar injury to the nose and upper jaw, with numerous contusions. Omitting these three, there are twenty-two cases of compound fracture of the humerus, with twenty recoveries, and two deaths. Amputation was done in fifteen cases: fourteen recovered; one died of pyæmia in twenty days. Seven patients underwent an amputation at the shoulder joint, and every one recovered. Seven patients were treated on the expectant plan; six recovered, and one died of pyæmia in fifteen days.

Recapitulation. — Cases, 22; recovered, 20; mortality, 9 per cent. Amputation, 15; recovered, 14; mortality rate, 6 per cent. Conservative treatment, 7; recovered, 6; mortality, 14 per cent.

This record is much more favorable than that for the previous five years. The mortality for that period in eighteen uncomplicated cases of compound fracture of the humerus was 55 per cent. Six out of the seven successful cases underwent amputation. The mortality-rate for ten years was 30 per cent.

The mortality in one thousand six hundred and eighty-nine cases of gunshot fracture of the humerus in the late war was 25.8 per cent.; nine hundred and ninety-six cases were amputated or excised, and the mortality was 21 per cent. The mortality-rate in the cases treated conservatively was 30 per cent.

The great mortality in this hospital was probably due in

a measure to the fact that injuries received in civil life are usually attended by more severe mental depression than those received in battle; moreover, the victims are often broken down by age and other circumstances.

II. *Fore-arm.*—There were thirty-five cases of compound fracture of the fore-arm. Both bones were broken in a large majority of the cases. Twenty-six recovered; nine died. Three of the fatal cases were complicated with other severe injuries as follows: One patient had a fracture of the skull, was trephined, and died of pyæmia; two patients had other fractures, and severe contusions, and died from shock in an hour or two after reaching the hospital. To make a fair estimate, these cases should be omitted. We then have thirty-two cases, with twenty-six recoveries. Rate of mortality, 18 per cent. Fifteen patients were treated by conservative methods, and thirteen recovered; or 86 per cent.

Eighteen patients underwent amputation, and thirteen recovered — 72 per cent. One of these cases should be set aside in estimating the percentage, as the patient had been trephined for a compound fracture of the skull. The amputation was done for the purpose of preventing a recurrence of secondary hemorrhage. This would give 76 per cent. as the ratio of recovery in the amputated cases; or a difference of 10 per cent. in favor of the conservative treatment.

The cause of death in six fatal cases was as follows:—

Four died of shock and exhaustion; one died of pyæmia, and one died suddenly, from some unknown cause, fifty days after receiving the injury.

Recapitulation.—Cases, 32; recovered, 26; mortality rate, 18 per cent. Amputation, 17; recovered, 13; mortality, 23 per cent. Conservative treatment, 15; recovered, 13; rate of mortality, 13 per cent.

III. *Thigh.*—The severity of the compound fractures of the femur is well attested by the facts, that of the twenty-three cases of these injuries admitted to the hospital only three recovered; and that fifteen died within forty-eight

hours after entrance. Many of the injuries were received on railroads and by falling beneath the wheels of heavily loaded wagons. These accidents were necessarily attended with very extensive bruising and mangling of all the tissues, the entire limb being crushed and literally torn off at the hip in some cases. The patient was not infrequently in a state of profound collapse on entering the hospital, and survived but a few hours.

The skull was fractured in three instances; both lower extremities were crushed in three others; and in two patients there were extensive injuries besides those of the thigh. Counting, then, only the fifteen cases which legitimately belong to this series, the mortality is reduced to 80 per cent.

Nine patients suffered amputation, and two recovered. Six were treated by conservative measures, and one recovered. The mortality was 77 per cent. in the former group, and 83 per cent. in the latter.

This result is in marked contrast with that obtained in this class of cases during the previous five years at this hospital. Of the nine uncomplicated cases of compound fracture of the femur, which were treated here during that period, four underwent amputation, and every one died; while of five patients who were treated by conservative methods, four recovered. That is, the mortality of the amputated cases was 100 per cent. the previous five years, and 77 per cent. the last five years. The mortality of the conservative cases was 20 per cent. for the former period, and 83 per cent. for the latter.

The rate of mortality in twenty-four uncomplicated cases of compound fracture of the femur treated in this hospital during the last ten years was 70 per cent. In the amputated cases it was 84 per cent.; whereas in the conservative cases it was only 54 per cent., or 30 per cent. in favor of the latter method of treatment.

The cause of death in the twelve fatal cases in this series was as follows:—

Seven died from shock; three died of pyæmia; one of trismus; and one from exhaustion.

Recapitulation. — Cases, 15; recovered, 3; mortality rate, 80 per cent. Amputations, 9; recovered, 2; mortality, 77 per cent. Conservative treatment, 6; recovered, 1; mortality, 83 per cent.

For ten years. — Cases, 24; recovered, 7; mortality, 70 per cent. Amputated, 13; recovered, 2; rate of mortality, 84 per cent. Conservative treatment, 11; recovered, 5; mortality, 54 per cent.

The results of the two modes of treatment in gunshot fractures of the femur in the late war of the Rebellion, as given in the Surgeon General's Report for 1865, were as follows:—

Number of cases, 1,939; recovered, 623; death-rate, 67 per cent. 822 cases underwent amputation, and 302 recovered; the ratio of mortality was 63 per cent. 1,117 cases were treated by conservative measures, and 321 recovered; the ratio of deaths was 71 per cent. Excisions of the femur are not included in any of the above estimates.

It will be noticed that the general rate of mortality, as given above, is not quite as large in the military as in the civil cases. The results in the amputated cases were 21 per cent. more favorable in the army than in this hospital. But in the conservative treatment we have the advantage by 17 per cent. These facts go to corroborate the common opinion that primary amputations do better in military than in civil hospitals, but that conservative measures are more successful in the latter.

I. *Leg.* — Seventy-four patients with compound fracture of the leg were admitted to the hospital during the period under consideration. The tibia and fibula were both broken in nearly all of the cases.

Forty-four recovered. Thirteen died of shock within thirty-six hours; amputation having been done in four of the cases.

Eight of the patients were too severely injured to allow them to be placed in this series, although two of them recovered. Every one of them had received a compound fracture of both legs, or of the leg and thigh. One patient

had received a compound fracture of the skull in addition to the injury to the leg. Another patient had sustained a rupture of the spleen, and a fracture of several ribs, besides a compound fracture of both legs; strange to say, he lived seven days. Two patients, with a compound fracture of both legs, recovered. No patient recovered from an amputation of both legs, in the very few instances in which it was done.

We have, therefore, sixty-six fair, uncomplicated cases of compound fracture of the leg below the knee, with forty-two recoveries, and twenty-four deaths.

Amputation was resorted to in twenty-seven instances, and the recoveries were fifteen. Half of the operations were through the thigh. This gives a mortality of 44 per cent.

Thirty-nine patients were treated by conservative measures and twenty-seven recovered. The mortality was 30 per cent., or 14 per cent. less than in the amputated cases.

Cause of death. — Eight patients died from shock; one from delirium tremens; and fifteen died from pyæmia.

Recapitulation. — Cases, 66; recovered, 42; mortality, 36 per cent. Amputations, 27; recovered, 15; rate of mortality, 44 per cent. Expectant plan, 39; recovered, 27; mortality, 30 per cent.

A general idea of the fatality of compound fractures in Guy's Hospital and in the Boston City Hospital may be readily obtained from the following table.

	GUY'S HOSPITAL.			BOSTON CITY HOSPITAL.		
	Cases.	Died.	Mortality.	Cases.	Died.	Mortality.
Arm and Forearm . .	94	16	17 per cent.	86	20	23 per cent.
Leg	202	56	27 " "	112	44	39 " "
Thigh	52	19	36 " "	24	17	70 " "
Total	348	91	26 per cent.	222	81	36 per cent.

This table includes all the cases of compound fracture admitted to Guy's Hospital during six years, and all the uncomplicated cases admitted to the Boston City Hospital for ten years.

The large mortality in this hospital was due in a measure to repeated epidemics of pyæmia. This disease can probably be mainly accounted for by defective drainage and ventilation, which have since been remedied, and also by the hospital being built on new land formerly reclaimed from the marsh.

We find it stated in the records, that in 23 of the 157 cases the fracture extended into a joint. As might be expected, these cases were very fatal when the knee was implicated. This joint was opened in seven cases; amputation was required in every instance, and only one patient survived. The ankle joint was implicated in four cases; three recovered, only one requiring amputation. The elbow was laid open in eleven instances, and all but one recovered. Six were treated by conservative methods, without any deaths. The motion of the joint was more or less impaired, but by no means entirely destroyed, in most of these cases.

One case of compound fracture of the elbow deserves mention, not only for the fact that the patient recovered from pyæmia, but on account of the novel treatment of the purulent deposit.

Mr. H—, a shoemaker, 47 years of age, was admitted to the hospital under the care of Dr. Fifield, September 2d, 1873. The patient had been struck by a railway train about an hour before his arrival at the hospital, and had received a compound and comminuted fracture of the left humerus into the elbow-joint. There was extensive laceration above and below the joint. The hemorrhage was moderate. Some loose pieces of bone having been removed from the joint, and the wound thoroughly cleansed, the arm was laid upon a pillow, and treated by irrigation.

The patient had a chill on the third day, followed by a high pulse and temperature. The arm was greatly swollen, and the borders of the wound were sloughing. He went on

badly until the 27th of September, when his pulse was 130, and his temperature 102.8° . His tongue was dry and brown, and he had great prostration, attended by profuse sweats. There was a large abscess over the right buttock, which was aspirated two days later, and twenty ounces of thin, fetid pus evacuated. Twelve ounces more were removed on the 30th.

Aspiration was performed every day but two until the 20th of October. The contents of the abscess gradually became more like serum in appearance, less in quantity, and the general condition of the patient steadily improved. On the 23d of October the last aspiration was performed and three ounces of serum obtained. Four days afterwards the abscess was well.

The man was discharged on the 19th of December. The wounds were healed and the elbow ankylosed. Several cases of acute abscess, the result of contusions, etc., have been successfully treated here by this method, two or three aspirations being sufficient in most of the instances. But it was remarkable that so favorable a result should have followed the treatment in the above case, considering the fact that the abscess was due to a pyæmic infection.

Many of the severe cases of injury brought to this institution are in adults whose health has been more or less impaired by hard work and poor living, by dissipation, or by some constitutional taint, as syphilis or tuberculosis. They are the worst subjects upon whom to undertake a conservative course of treatment, and especially in a large hospital. Too often they succumb to their injuries after going through a long and painful period of suppuration, hectic and exhaustion, or they die of some intercurrent affection.

The difference in the mortality of compound fractures in the upper and the lower extremities is very striking in the preceding cases. The ratio of deaths in the former series was 14 per cent., while in the latter it was 44 per cent. Leaving out the cases of injury to the thigh, it will be found that the ratio of mortality in the leg alone was two and a half times as large as that in the whole upper extremity,

which included seven cases of injury requiring primary amputation at the shoulder-joint.

The same difference is seen in the results of the two plans of treatment of these injuries. Compound fractures of the upper extremity treated by conservative measures gave a mortality of 13 per cent. ; while those of the leg alone proved fatal in 30 per cent. The cases treated by amputation gave a mortality of 15 per cent. in the upper extremity, and 44 per cent. in the leg.

Another very noticeable feature is the marked frequency of pyæmia in those patients who had a compound fracture of the leg. It will be remembered that this disease was the cause of death in three cases of injury to the upper extremity, in three cases of injury to the thigh, and in fifteen cases of injury to the leg. That is to say, this complication was six times as frequent in lesions of the lower extremity as in those of the upper.

The preponderance of pyæmia in the cases of injury to the lower extremity may be partially explained as follows: The leg being situated at a greater distance from the heart, the reparative as well as the nutritive processes are less active in that part than in the upper extremity. This is evident from the fact that wounds of the foot and leg do not heal as readily as those of the hand and arm. The circulation being more sluggish in the leg, congestion and effusion are liable to result; repair is retarded or entirely prevented; the tissues degenerate and break down; suppuration follows, the cavities and fragments of the bones becoming inflamed and necrosed. These morbid conditions, so favorable to the advent of septicæmic affections, continue, each day rendering the patient more liable to be attacked by this disease.

As stated in the first part of this paper the rate of mortality of the compound fractures in this institution for five years was 41 per cent. The ratio of deaths from pyæmia was 14 per cent. ; that is, one-third of the entire mortality in these injuries was due to this affection. During the past ten years more than a quarter of the fatality in this class of accidents has resulted from this disease.

During the past five years two-thirds of the patients who

died from pyæmia had submitted to amputation, and in the previous five years every fatal pyæmic case but one had undergone this operation. The experience of this hospital corroborates that of Guy's in the fact that pyæmia is very much more frequent in the cases of amputation than in those treated by conservative methods. The statistics of Guy's Hospital bring out this fact in a very strong light :—

Of 184 cases treated by amputation, 89, or 47.7 per cent. died ; 44 died of pyæmia, — 23.9 per cent.

Of 606 cases treated without amputation, 103 (17 per cent.) died ; 24 died of pyæmia, or 3.9 per cent.

The following is the record of the Boston City Hospital, for ten years :—

Of 143 cases treated by amputation, 62, or 43 per cent. were fatal ; 24 died of pyæmia, or 16 per cent.

Of 134 cases treated expectantly, 63 died, or 47 per cent. ; 11 died of pyæmia, or 8 per cent.

The above numbers include all the cases admitted to this institution without regard to complications. Had the complicated cases been omitted, the contrast would have been more marked. As it is, it will be seen that pyæmia was twice as frequent in the amputated cases ; while in Guy's the ratio was as six to one.

This difference is altogether too large to be accounted for by any differences in the character of the cases. The following circumstances help to explain the fact. The shock to the patient is necessarily much increased by amputation ; the medullary cavity and other bony canals are more directly exposed to the action of any deleterious materials in the wound, which not infrequently give rise to osteo-myelitis and necrosis, very common precursors of pyæmia ; the large vessels and nerves as well as all the soft structures of the limb are divided, thus often exposing a much larger surface to the action of septic matters. These are a few of the reasons why pyæmia is more frequent after amputations than in cases treated expectantly.

TREATMENT. — The most important and oftentimes the most difficult question to decide in the severer cases of compound fracture is that of primary amputation. The condition

of the main vessels and nerves and of the soft parts generally should influence our decision fully as much as, or even more than, that of the bones alone. If the knee-joint be opened, or the lower part of the femur crushed, amputation is generally the best practice. Excisions of this joint seldom succeed in adults, and a conservative treatment is usually unsatisfactory. In cases where the shoulder or the elbow is implicated excision is preferable to amputation. Conservative treatment of the wrist and ankle joints may be followed with a fair prospect of success. Compound fractures of the shafts of the bones seldom demand an amputation unless attended by great comminution, or extensive laceration of the soft parts. Bryant says, "If the surgeon is in doubt as to the necessity of an immediate operation, let him wait; unless the patient be old, when let him act." In making up our minds on this point it is to be remembered that the expectant treatment is more certain to succeed in the young than in adults; in the temperate than in the intemperate; in courageous and hopeful subjects, than in the gloomy and despondent; in patients in the country and in those free from any constitutional taint.

Many of the cases of compound fracture admitted to this hospital the past five years offered no choice in the modes of treatment. The injuries were so severe, or the hemorrhage so uncontrollable, that an amputation afforded the only chance for the safety of the patient. Limbs were torn off by machinery, or crushed to a pulp under car-wheels; or vessels and nerves were so extensively lacerated as to discourage all attempts to save the injured parts. Strenuous efforts were made to preserve every limb that offered the least prospect of success; but in several cases in which amputation was plainly indicated we were compelled to follow a conservative plan of treatment, as the patients refused to submit to an operation. A case in point was that of a man admitted under Dr. Thorndike's care with a compound and comminuted fracture of the patella, and a dislocation of the scaphoid bone of the corresponding tarsus. The knee-joint was freely exposed, the patella shattered into numerous fragments, and the soft parts in the vicinity badly bruised.

Amputation was strongly urged upon the patient, but he refused his consent. The result was that the joint became disorganized, the bones extensively necrosed, and the most profuse suppuration took place throughout the limb. He lingered several weeks, and finally died from exhaustion. It is fair to suppose that he would have recovered with an amputation. Several similar cases have been under observation here.

On the other hand, it should be said that occasionally a patient recovered under conservative treatment from injuries that seemed to require amputation. The following is one of the few cases of this kind : —

A boy, seven years of age, fell beneath the wheels of a truck and received the following injuries. The left knee joint was laid open by a large lacerated wound, extending from the middle of the leg to the upper third of the thigh. The skin and cellular tissue were destroyed and the muscles extensively bruised and lacerated. The lower end of the left humerus was badly comminuted into the joint, but fortunately the skin, though severely bruised, was not broken.

Amputation of the thigh was advised by Dr. Cheever, but the parents refused their consent. The leg was treated with simple dressings upon a long, straight splint. An internal angular splint was applied to the arm. The boy was discharged, after one hundred and twenty-three days, with his wounds nearly healed. The elbow and knee were both pretty firmly ankylosed, but the patient could walk quite well. The fortunate result in this case was mainly owing to the patient's age, and to the favorable hygienic condition of the hospital.

During the past five years the ratio of amputations to cases has been 47 per cent., which is 10 per cent. less than during the previous five years.

The mortality from shock in primary amputations from 1864 to 1869 was 58 per cent.; while it was only 18 per cent. for the succeeding five years; or 31 per cent. for the entire term of ten years.

The large mortality following primary amputation, and the increased liability of patients with amputation to be

attacked with pyæmia, are strong arguments in favor of a conservative treatment. As stated above, Bryant's statistics show that this disease is six times as frequent in cases of compound fracture which undergo amputation, as in those treated expectantly; and the records of this hospital for ten years show that it is twice as common in the former class as in the latter. So far, then, as shock and pyæmia are concerned, we think a patient stands a better chance for his life if the injuries under consideration are treated by conservative measures.

Another important point demanding attention is whether the limb, provided it can be saved, will be as serviceable as an artificial one. This will depend somewhat upon the patient's occupation. Practically, almost any kind of an arm is preferable to an artificial one, as the latter is of comparatively little use. But it is different with the lower extremity; the foot or the leg may be so deformed, or so troublesome from various causes, as to prevent the patient from following any occupation, or taking any comfort in life. The writer recently amputated a leg in the case of a man, who, for twenty-five years, had been trying to use a maimed foot. The outer side and sole of the foot had been crushed by a car-wheel, and the fourth and fifth toes and metatarsal bones had been removed. The wound over the heel could not be kept closed, and hence it was a constant source of annoyance to him. The foot during all those years was worse than none, and was of much less use to him than an artificial one would have been. In our opinion, the upper extremity should very seldom, if ever, be amputated for the reason under consideration; but the foot and leg may occasionally require it on this account.

It has been necessary to resort to amputation in a few instances in this hospital, the past five years, for the purpose of saving the patient's life from a persistent hemorrhage. The tissues in these cases were badly lacerated, and the bleeding, which was principally venous, was uncontrollable by the ordinary means in use for such cases at that time. We have seen two patients with crushed thighs die from this cause, both having refused amputation. Esmarch's tourni-

quet, the only one now used in this institution, had not then been introduced. It would undoubtedly have saved these lives for the time being.

Conservative treatment was usually conducted upon the principles so ably recommended by the late Dr. William J. Walker, in an address before the Massachusetts Medical Society in 1845, and so successfully practised by him in numerous instances. The principal points requiring attention in carrying out this method are the following: Free incisions through the skin and fasciæ to relieve tension and give a good outlet for all discharges; a thorough cleansing of the wound of all foreign bodies, such as bits of bone, splinters, dirt, etc.; a resection of the ends of the fragments whenever they cannot be readily replaced; and an easy position of the limb, with as little restraint as possible compatible with a favorable position of the fragments. If there be comparatively little laceration and destruction of the soft parts about the fracture, and the bones be not comminuted, the less the wound is disturbed the better. But if the opposite condition of the structures is present, then the incisions are of the utmost importance. Blood and serum, and so on, will be thrown out, and become infiltrated among the tissues, and will be very apt to produce mischief, if confined by the skin and fasciæ; until, finally, incisions will be demanded to relieve the very trouble which they might have prevented, had they been used at the proper time. It is also just as important that loose pieces of bone, and all irritating substances, should be removed from the wounds at the earliest possible moment, or they will keep up a constant suppuration, prevent repair, and greatly increase the patient's suffering, and also the danger of contamination by septic matters. These two points should receive the promptest attention in the treatment of these fractures by conservative measures, or there will probably be ample reason to regret it afterwards.

Compound fractures of the upper extremity were usually treated by placing the limb upon a pillow, supporting it on a tin or wooden splint, either straight or angular according to the location of the wound. If the elbow-joint was injured,

and ankylosis was to be expected, an attempt was made to keep the fore-arm at a right angle, as being the most useful position for a stiff arm.

For this class of injuries in the lower extremities the long fracture-box, either straight or in the form of a double-inclined plane, was and is the favorite appliance. It is made to extend above the knee so as to confine that joint, and has a movable foot-piece which can be set at any angle. Well-padded and protected with oiled silk; it makes an excellent apparatus in which to treat these fractures. The fragments can usually be retained in as good a position as in any appliance, the dressings can be kept clean, the wound can be easily inspected without disturbing the limb, and the apparatus is generally comfortable to the patient.

Pott's outside splint is, perhaps, better than the box for those cases in which the fracture is situated in the lower third, and where the tissues are injured on the back of the leg, but are sound upon its outer surface. Fully as much attention is required, however, to prevent mischief from undue pressure, as in the use of the box.

When the laceration is not too extensive and suppuration is moderate, either of the following most admirable splints may be applied: first, Day's carved, side splints, well-padded and firmly bound on with straps and buckles, or with adhesive plaster and bandage. Second, a long, posterior, carved splint, reaching from the upper part of the thigh to the sole of the foot; it should have an immovable foot-piece attached to the lower end at right angles with the main portion. We have made a very good appliance of this kind out of a Goodwin's double-inclined plane, by setting and fastening it in a straight position. By the use of the former apparatus any lateral deformity, and with the latter any antero-posterior deformity, may be easily corrected. Both appliances allow the patient to change his position in bed with safety, or even to sit in a chair with his leg resting upon a pillow.*

* These two kinds of splints are excellent in cases of simple fracture of the leg after the first few days. In fact, we know of no better appliances for the majority of cases.

The leg was swung in Smith's anterior splint in several instances with fair results. This appliance is well-adapted for certain cases of fracture, either simple or compound, in which the patient's movements cannot be restrained, as, for example, during an attack of delirium tremens. A simple fracture has occasionally been prevented from becoming compound by the use of this splint; but it will not always succeed under these circumstances.

The immovable bandage has been used but little in the early stages of the treatment of compound fractures, for the reason that great difficulty is experienced in preventing the discharges from getting between the splint and the limb, and becoming exceedingly offensive. Another and greater objection is the fear of gangrene, from obstructed circulation. Fortunately, this accident has never happened in this hospital; but it has in others more than once, and with fatal results. In the later stages, when suppuration is slight, this bandage is of great value.

Plaster of paris and dextrine are the favorite materials here for stiffening bandages. The former is very firm, but heavy and difficult to remove. The latter is lighter, more easily applied and removed, and is sufficiently firm; it can be kept in a bottle for a long time, mixed, and ready for use.

Treatment of these fractures with dry earth or bran has met with but little favor. Beside hiding the wound from sight, it is far from being a neat dressing; moreover, in a few cases in which it has been used the results were no better than those obtained by less objectionable modes of treatment.

Carbolic acid has been and is used a great deal in this hospital, yet the true antiseptic treatment of open wounds has never been put in practice until quite recently. It is said that Mr. Lister, the champion of antiseptic surgery, gets no better results in his cases than does his colleague, Mr. Spence, whose patients are treated in the same institution with the simplest dressings. Furthermore, it is stated that the experience of many of the best surgeons in the use of the ordinary methods compares favorably with the results obtained by Mr. Lister. Yet any method of treating open

wounds which receives the support of so many reliable men, and for which are claimed such great advantages, merits the most thorough and careful trial by all hospital surgeons, until its value is fully ascertained. It is to be hoped that the method will receive due attention here, before another quinquennial report is written. At present, the antiseptic treatment is troublesome, inasmuch as all the minutiae require the utmost care to make it successful. The surgeon himself must apply the dressings; this would be no easy task for a man with sixty patients under his charge, and half or two-thirds of them having open wounds, as is not unfrequently the case in this hospital. Hence, until it is proved beyond a reasonable doubt that the antiseptic treatment is superior to all others, and until a more convenient mode of applying it shall have been devised, it can hardly supplant the more practicable methods, which have been so thoroughly tested, and have given such good results.

During the summer months tents have been erected in the hospital yard for the reception of patients with severe injuries and capital operations. Many cases of compound fracture were treated in these structures, and it is the opinion of the surgical staff that better results were obtained here than in the house.

As regards the dressings made use of during the early stages of the treatment of these injuries, cold water and weak solutions of carbolic acid and chlorinated soda were the most common. Irrigation has been used to some extent with good results. Some of the simpler cases, especially in the upper extremity, did admirably under a dry dressing, which was allowed to remain undisturbed for two, three or four days at a time. As a rule, the simpler the apparatus and the applications used in the management of these accidents, the better for the patient; his recovery depends far more on the reparative powers of his system, and on the hygienic condition of his surroundings, than upon all other things combined.

I would submit the following *résumé* of the treatment of compound fractures, as the conclusions derived from a

review of the experience of this hospital for ten years, and from various other sources : —

I. The conservative treatment should be adopted in the majority of cases.

II. Primary amputation should be resorted to as seldom as possible, on account of the danger from shock, the increased liability of amputations to be followed by pyæmia, and the more favorable results of secondary operations.

III. Amputation is usually to be advised, if the knee joint is opened, or the lower half of the femur comminuted, or the main vessels and nerves destroyed, or if there be extensive laceration of the soft structures with comminution of the bones.

IV. If the bones are not comminuted, the soft parts are not much injured, and the opening is not large, an effort should be made to convert the compound into a simple fracture by immediately closing the wound with a dry compress, or one moistened in blood or carbolic oil.

V. Should the bones be comminuted or the tissues much bruised, free incisions should be made through the skin and fasciæ, to relieve tension, and remove fragments, and give a ready exit to all discharges.

VI. Loose pieces of bone, splinters, and foreign substances of all kinds, should be removed at the earliest possible moment, and we should not hesitate to enlarge the wounds freely for this purpose.

VII. The utmost cleanliness of the patient's wounds, dressings, bedding, and of all his surroundings, should be constantly preserved.

VIII. The patient should breathe pure air day and night.

IX. The limb should be allowed to rest in the easiest position for the patient, which will allow the fragments to be kept in their proper place, the dressings to be easily made, and excoriations from undue pressure to be avoided.

CASE I.

THOS. E. _____ Jan 8th '72.

R.V. 4th



Lith. Armstrong & Co. Riverside Press, Cambridge.

O. F. W. ad nat. pinct.

CASE 2.

Wm. C. Jan. 4th '72.

R.V. 18



Lith. Armstrong & Co. Riverside Press, Cambridge.

O. F. W. ad nat. pinx.

ON ALBUMINURIC RETINITIS.

BY O. F. WADSWORTH, M. D.

During the past five years, by the kindness of my colleagues in the Medical Department of the hospital and elsewhere, as well as in my own practice, I have been able to examine with the ophthalmoscope a not inconsiderable number of cases of Bright's disease. In consideration of the not unimportant differences of opinion which still prevail among writers on the subject, it may not be superfluous to present the conclusions formed, partly from my own observation, partly from the study of published cases. A few cases are briefly related by way of illustration.

The appearances which are generally described as characteristic of the retinitis accompanying Bright's disease are as follows: brilliant white or yellowish-white dots or patches in the retina, chiefly grouped about the optic nerve and the region of the macula, of various size and shape, the larger patches often showing on close examination that they are made up from the running together of smaller dots or patches; in the more typical cases, a peculiar figure, made up of white radiating stripes or dots, at the macula, and occasionally a broad, irregular white ring, more or less complete, about the disc; with these white patches, the ordinary signs of retinitis and neuritis, opacity and striation of the retina, more marked about the optic disc, and of the optic disc itself, dilatation and tortuosity of the veins, normal or diminished size of the arteries, hemorrhages, striated, round or oval, often also whitish stripes bordering the larger vessels on or near the disc; all these more or less pronounced. Both eyes are affected, though not always by any means to the same degree.

CASE I.—Thomas E., a painter, aged 25, entered the hospital Dec. 2d, 1871. Nine weeks before he had first noticed swelling of the ankles, and in the course of two days the swelling extended to the thighs and scrotum. The œdema at the time of his entrance was marked on the legs and over the sternum; he felt weak, but otherwise well. Micturition was frequent and scanty. A large amount of albumen with casts was found in the urine.

December 5th. In the right eye the outline of the disc was indistinct, its surface scarcely elevated, showing a reddish-gray striation, which extended a short distance upon the retina. The veins were somewhat enlarged. A few minute, striated hemorrhages lay between the disc and macula, and in the same region were several glaring white patches, mostly of small size. In the macula were a few small decolorized hemorrhages. In the left eye similar changes were present, but of a less degree. V., R. = $\frac{1}{2}$; L. = $\frac{3}{4}$. A cathartic course of treatment was instituted, and on December 23d the patient was discharged, with the œdema mostly confined to the ankles. So far as the eyes are concerned the subsequent records refer to the right only. Changes in the left were similar.

December 21st. Two days before his discharge, the striation of the disc had much diminished, its surface was no longer elevated, the central veins were still a little enlarged, the arteries were normal. There were a number of hemorrhages, most of them wholly or partially decolorized, situated to the outer side of the disc and along the main vessels. Near the centre of the macula were several whitish or faintly reddish-white spots, and above and to the inner side of these several white, narrow, short streaks; also many minute whitish or faintly reddish dots near the macula were observed.

January 8th, 1872. The man was seen as an out-patient. The condition of the retina of the right eye is shown in the plate, and did not differ much from that on December 21st. V. of each eye at this time = $\frac{2}{3}$.

February 14th. E. was again admitted to the hospital, his general condition much the same as on his first admission. Two days later, ophthalmoscopic examination showed that

several of the decolorized hemorrhages seen January 8th had been absorbed, but there were some fresh ones. The whitish spots in the macula had become pale red, and the glaring white spots and streaks smaller and less numerous.

During the next month there was occasional headache; but the general condition improved, and by March 22d the anasarca was slight, and confined to the left ankle.

At this date the outline of the disc was sharper, and most of the former hemorrhages and of the white spots about the macula had disappeared; but there were one or two fresh hemorrhages, and many small, elongated, bright white spots had made their appearance between the macula and the disc. The next day he was discharged.

May 1st. Seen as an out-patient. The traces of hemorrhage have almost entirely disappeared, but there is still a rather indistinct, streaky look of the whole fundus. The white spots and patches have disappeared, only toward the macula are there still some dull gray spots, and thin, irregular greyish lines. $V. = \frac{2}{2} \frac{0}{0}$.

May 15th. Again admitted to hospital with general anasarca, hacking cough and slight expectoration, pain in small of back, urine loaded with albumen and containing hyaline and granular casts.

May 20th. The outline of the disc has become indistinct and an increased number of fine vessels are seen upon it. There are several hemorrhages in the retina, mostly decolorized. Above the macula and between it and the disc are a number of minute dots, glaring white or whitish. Near the centre of the macula are some changes of color, due to alterations in the pigment of the epithelial layer. There was no special change after this till June 4th, when the patient was discharged at his own request and lost sight of.

CASE II. — William C., coachman, aged 41, entered the hospital November 28th, 1871. Four days previously pain and swelling of the left leg just above the ankle had come on and continued. The diagnosis at first wavered between abscess and rheumatism. During the first few days of his stay in the hospital there was constipation and some head-

ache, but the headache passed off as the constipation was relieved.

Dec. 16th. Eight ounces of pus were removed from the left leg. Soon after this he began to complain of cough, with muco-purulent expectoration, and cedema of both legs appeared.

Dec. 30th. The urine was examined for the first time, and a small amount of albumen was found.

January 1st, 1872. I made an ophthalmoscopic examination. When I entered the ward the patient was sitting up in bed, reading a poorly printed newspaper, and was disposed to be indignant at the supposition that there could be anything the matter with his eyes. He held the paper at arm's length, and read it easily, and subsequent tests showed $V. = \frac{1}{2} \frac{8}{0}$ in either eye.

In each eye the outline of the optic disc was indistinct; there were a few small hemorrhages in the retina, groups of small, whitish patches between the disc and the macula, and glaring white patches about the macula.

The condition of the right eye, on January 4th, three days later, is shown in the plate.

From this time the patient grew worse, had vomiting, headache, and dyspnoea, and died February 4th. No autopsy could be obtained.

CASE III. — William M., aged 35, was admitted to the hospital February 14th, 1872, on account of vomiting, dull pain about the umbilical region, and constipation, which had commenced three weeks previously. Five years before, after exposure to cold, he had had swelling of the feet and face, and pain in the back, from which he recovered in three months. A few months later he was employed in a paint-mill for a short time, but gave up this work on account of pain in the abdomen and constipation. He had since worked at gas-fitting, and had similar attacks of pain and constipation about once in six months. For the last six months he had had wrist-drop. On admission the abdomen was full, but not tender. There was no blue line on the gums. Micturi-

tion was reported as free, but there is no record of examination of the urine.

Two days after admission $V. = \frac{2}{2} \frac{0}{0}$ in each eye. In the right eye no outline of disc was to be seen. The vessels were partially obscured over the disc and for a considerable distance beyond it, their size being apparently normal. Between the disc and the macula a mass of irregularly shaped white spots, forming together a large patch, which extended over a space about two and a half times the diameter of the disc in the vertical, and one and a quarter times the diameter in the horizontal direction. This patch was more glaring white on the side toward the macula, more grayish-white toward the disc, where its boundary was ill-defined; the edge toward the macula was convex. On the macula itself were a few small spots, as if from changes in the epithelial layer; the centre of the spots paler, the periphery darker, than the surrounding parts. Left eye much the same.

The patient had several attacks of vomiting while in the hospital, but no special constipation.

March 5th. Swelling of the face appeared, and there is a record of considerable albumen in the urine on the following day.

March 9th. There was an attack of pain in the left side of the chest, and dyspnœa, with general subcrepitant rales and bright red sputa; but the next day the patient was easier, and, on March 12th, was discharged at his own request, not relieved.

But the changes which have been referred to as characteristic are not the only ones that may occur with Bright's disease.

The white dots and patches do not appear at the commencement of the retinal affection; the first signs are those of retinitis or neuro-retinitis, and the degree of general opacity and swelling of nerve or retina, venous hyperemia and hemorrhage, may vary much. The time at which the white dots appear after the first inflammation of the retina also varies; they may follow it at a longer or shorter interval, or may, at least if the retinitis is but slight, even never

appear at all. Graefe described a rare form, in which there is a simple hemorrhage into the retina, proceeding from the papilla toward the equator, and sometimes reaching an enormous size. With this, he stated, white patches seldom occur.

The changes may also assume the appearance generally described under the name of apoplectic retinitis, where the opacity of the retina is extensive and great, and the hemorrhages are large and numerous. Here white patches appear later.

In two cases which I have seen, covering the macular region for a space of one and a half to two disc-diameters, was a mass of white patches, with grayish shading, resembling in a very remarkable degree a pile of fleecy clouds. Nor was the resemblance owing merely to variations in color of the patches, for the paralactic displacement obtained with the upright image showed that the "clouds" formed real elevations, with irregularly rounded surfaces, and that the grayish shading was due to the less amount of light thrown back from their steep sides and the clefts between them. The appearance seems worth mentioning, as I do not remember to have seen it described.

Separation of the retina may also occur as a complication of albuminuric retinitis; but it seems to be exceedingly rare. It was observed in the following case:—

Honora K., aged 22, was a patient in the Massachusetts General Hospital for some time, with Bright's disease; was afterward sick at her home, and finally had convulsions, and was sent to the City Hospital, April 12th, 1871, in a semi-comatose state, and died the next day. Her urine had been loaded with albumen.

An hour or two after her admission to the hospital I had an opportunity to examine her eyes.

Right.—Considerable chemosis of the conjunctiva, and a large ecchymosis at the outer side of the cornea; perhaps slight exophthalmos. On the upper and inner part of the sclera, near the cornea, several dark, bluish spots, shading off rapidly at the edges, about 1''' in diameter; tension decidedly increased; cornea and aqueous clear; anterior chamber shallow; pupil large, slightly irregular, not respond-

ing to light; iris somewhat discolored; the disc swollen, its outline almost indistinguishable; the arteries indistinguishable, the veins large and irregular; the retina everywhere infiltrated, grayish-white, with whiter patches here and there, and scattered hemorrhages. In the macular region a very large, whitish-gray patch, with several hemorrhages and some small, glistening, silvery spots on it. A separation of the retina, pretty sharply defined generally, extended nearly all the way round in the equatorial part of the fundus.

Left. — The external appearance normal. The fundus could not be accurately reviewed, on account of the small size of the pupil and the restlessness of the patient; but it was seen that the disc was swollen, the veins large and irregular, the retina infiltrated, grayish, with whitish patches and hemorrhages.

The fact that a simple retinitis may be developed and pass off without the formation of white patches has already been referred to. So far as my own observation goes, a small amount of retinitis and hemorrhage may result in resolution of the retinitis and absorption of the hemorrhage, or death may supervene, in either case, without the formation of white patches. Whether an extensive inflammation of the retina may ever pass off without development of white patches, I am unable to decide.

There may be more or less diffuse opacity of the vitreous, or hemorrhages into it. The visible choroidal changes appear late, and have nothing characteristic; they consist of variations in the amount of pigment in the epithelial layer. Such changes were present in Cases I. and III.

The general inflammatory symptoms may and often do diminish or disappear, while the white dots and patches remain; but even the latter may eventually vanish entirely. In the case of Edmands (Case I.) at one time, the only remains of the white patches were a few dull-gray spots, and in the case which follows all traces of the retinitis passed off completely.

Mary O'H., aged 24, was admitted to the hospital November 13th, 1872. She was four months pregnant and had for three weeks had general anasarca, with much headache

and occasional vomiting and diarrhoea. She remained in the hospital, with an interval of ten days, till the end of January, 1873. During this time, there were albumen and casts in the urine, œdema of the extremities and face, and almost constant headache. Toward the last of her stay the eyes were examined and the retina found normal.

February 27th, 1873. She was admitted to the Boston Lying-In Hospital. There was œdema of the face, hands and legs. The urine contained granular casts and was loaded with albumen. There was occasional vomiting. A month later another examination of the eyes found them still normal.

April 5th. A female child was born, without accident during labor. The œdema continued, however, and albumen and casts were still found in the urine; two weeks after delivery the patient began to complain of failure of sight in the right eye.

April 26th. In each eye the disc was slightly indistinct in outline, somewhat opaque, pale. The central vessels appeared normal in size and course. There was slight lack of transparency in the retina generally, but it contained numerous grayish-white, irregular, cloud-like patches in all directions about the disc, though more to the outer side, many of them situated in immediate connection with veins. V., R. = $\frac{1}{8}$; L. = $\frac{1}{4}$.

From this time there was slow improvement, but when the patient left the hospital, May 17th, the urine still contained albumen and granular and epithelial casts. In the right eye were a few faint remains of the irregular whitish patches seen at the previous examination. In and about the macula were numerous, white, sharply-defined patches, often band-shaped, with irregular edges, and assuming a generally radiating arrangement. Around the disc, also, were some white patches. The only changes visible in the left eye were three or four white, sharply-defined patches, of an elongated pear-shape, a little downward and inward from the macula. The vision was not accurately tested, but was better in the left eye, and worse in the right, than at the former examination.

In the middle of the following July the white spots in the retina were still present, but smaller. V. was $\frac{1.5}{80}$ in both eyes.

Early in 1875 the patient gave birth to another child, but had no return of her former trouble during pregnancy or afterwards. I was again able to examine her eyes in May, 1876, and found no trace of the white patches in the retina. The nerves were rather opaque and pale, and vision was not up to the norm, but there was no opportunity to test it carefully, nor could urine be obtained for examination. I have learned, however, from Dr. W. L. Richardson, that he examined the woman's urine May 27th, 1876. He found no casts, and, though there was a small amount of albumen, it was not more than a leucorrhœa which was present might have accounted for.

Opinions differ much as to the diagnostic value of the retinal changes. Mauthner* is the most sanguine; he makes the rather extraordinary statement, that when the completely typical appearances are present the diagnosis of Bright's disease may be made with even greater certainty by the ophthalmoscope than from an examination of the urine. He adds, however, that it is only in the most exceptional cases that such completely typical appearances are found.

Even with the last qualification, this opinion, I think, can hardly be adopted. The appearance accepted as the most typical, the stellate figure about the macula, which is, according to many other writers beside Mauthner, comparatively seldom present, may occur with other varieties of retinitis also. Still it must be conceded that it is much more common with Bright's, and gives at least a great probability of the presence of that disease.

The ring around the disc is also more frequent with retinitis due to Bright's disease than when arising from other causes, but it, too, is rare. The white dots and patches in the retina, brilliant and sharply-defined, at least if they are at all numerous, whether other signs of retinitis are present or not, are also much more likely to be due to Bright's. These, too, are the most common characteristic changes.

* Lehrbuch der Ophthalmoscopie, page 366.

Apoplectic retinitis, though often occurring with albuminuria, can hardly be considered specially diagnostic, since it is at least as often connected with other affections; but its discovery should always awaken suspicion. The rare variety, with large hemorrhage, which Graefe described, he regarded as likely to lead to error of diagnosis. Certainly, the simple diffuse retinitis, more or less extensive, with or without hemorrhages, has nothing characteristic about it.

Retinitis due to many other affections may present appearances resembling those with albuminuria. I have observed white patches in the retina with cerebral tumor, leucocythemia and (probable) meningitis; and the stellate figure at the macula also has been observed by others in connection with cerebral tumor, leucocythemia, diabetes. Not once only has Bright's disease been diagnosed by experienced and able observers from a retinitis due to cerebral tumor, and *vice versa*. The retinitis due to leucocythemia, though often presenting the orange-yellow color first described by Liebreich, by no means always has this color. Of the two cases that I have seen, in one there was nothing peculiar in the color of the fundus generally, or of the hemorrhages; in the other, the color was so little pronounced that probable diagnosis of Bright's disease was made till the absence of signs in the urine and the discovery of the greatly enlarged spleen called attention to it, and gave the true character of the disease. In syphilitic and in apoplectic retinitis from other cause, may the appearances resemble those with Bright's. On the other hand, I have known a case of albuminuric retinitis to be regarded at first as syphilitic.

With regard to the relative frequency with which changes in the retina, especially such changes as may be called characteristic, occur, few statistics exist. Frerichs* found among 41 cases, 6 with more or less disturbance of vision. Lebert† found amblyopia in one-fifth of his cases. These statements, not based on ophthalmoscopic examination, must be admitted to be of but doubtful value. On the one hand,

* Die Brightsche Nierenkrankheit, page 93.

† Handbuch der practischen Medicin, 1859, B.2, page 608.

cases in which there was retinitis without affection of vision, or with so slight affection as to escape notice (compare Case II.), would have been set down as normal; on the other, impairment of vision might have been present from a variety of other causes, notably from loss of accommodation on account of an enfeebled condition of the patient, without any retinitis.

Wagner's* statistics are more reliable. He found in 157 cases, 18 with ophthalmoscopically visible changes; but only 10 of these could with certainty be ascribed to albuminuric retinitis.

Among 90 unselected cases† at the hospital, examined with the ophthalmoscope, I found white dots or patches in 15, but in three of these the dots were very minute and few in number, and could not be considered as "characteristic." It should be mentioned that O'H., whose case has been reported, was among the 90 cases, and has been counted among those having white patches in the retina, although these made their appearance only after she left this hospital. In another case two examinations at an interval of three weeks gave a negative result, but on a third, two weeks later, white patches were found.

The stellate figure at the macula was found fairly well-marked in only two of the cases, and, in one of these, in one eye only. There were nine cases with signs of simple retinitis, or hemorrhage alone, often very slight. Two other cases presented peculiarities about the optic disc which might have been the result of previous inflammation.

Some of these cases were examined only once with the ophthalmoscope, others two or more times, at an interval of weeks. It must of course be assumed that retinitis was developed later in a portion of those cases in which no changes in the retina were found, and, if they could all have been followed to the end, the proportion showing retinitis would undoubtedly have been greater than that given above.

* Virchow's Archiv, B. XII.

† For considerable periods, every case in the hospital diagnosed as having Bright's disease was examined.

In a certain number of cases of Bright's disease, the loss of vision is the first symptom to attract the patient's attention sufficiently to lead him to call upon a physician. In the larger cities probably most of such cases go to an oculist first. Among a number of such instances coming under my observation, in not all were the appearances, at least when first seen, in any respect characteristic. One, a young woman of 22 or 23 years, presented a marked neuritis; the nerves were much swollen, opaque, with steep sides, the opacity of the neighboring retina rapidly fading at a short distance from the disc; the veins were distended, tortuous, hidden here and there, the arteries almost indistinguishable; in one eye there was a partially decolorized hemorrhage near the nerve; in short, typical choked discs, such as have been described as characteristic of cerebral tumor. A few weeks later, white patches in the retina were developed. In this case, as in others, the general symptoms were slight, and might have been due to simple anemia; they were such, however, as should of themselves have led to suspicion of kidney trouble, and to examination of the urine. In all there was evidence of the disease in the urine.

It is well-known that serious disease of the kidneys may sometimes exist, and yet neither albumen nor casts be found for some time. *A priori*, it is probable that retinitis should sometimes be present in such cases. Indeed, there are a very few cases on record in which retinitis, even the star at the macula, has been discovered, while, in spite of repeated examination of the urine, albumen and casts have been found only after weeks or months. Are the retinal changes alone sufficient evidence for the formation of a diagnosis in such cases? I am unable to think so, in the face of what has been already stated.

It appears to me that never can a positive diagnosis be made from ophthalmoscopic examinations alone. A high degree of probability may be attached to a diagnosis so made in a few cases; in some others there would still be a considerable degree of probability. In the vast majority of cases the ophthalmoscope would show no change, or

changes in no respect characteristic. The urine must be the final test.

The amount of affection of vision may vary very much. It may be not noticed at all, as in Case II., or be but slight, as in Case I., or may be very great indeed. Seldom does it lead to total blindness; nor is the amount of disturbance of vision always in even approximate relation to the amount of visible alteration. (Compare Case III.) Possibly the pathology may in part explain this.

Uræmic attacks of blindness, so called, come under rather a different category, and are not necessarily accompanied by visible change. They may complicate a retinitis, or, more rarely, appear without it. Graefe inclined to the belief that there was a certain connection between uræmic blindness and retinitis, since he had seen cases in which retinitis followed it.

The prognosis as to vision may be said in general to be favorable, provided the patient does not succumb to the disease too early, and this, even when the loss of vision is very great and the alterations in the retina are marked. A man, seen in the spring of 1875, with numerous small white spots in the retina, but very fair vision, stated that for a long time during the previous summer he could only distinguish the movement of his hand a few inches in front of his eyes. Another, but a short time before his death, and when so much swollen that he could not lie down, had fair vision, and presented only traces of a retinitis from which he had been nearly blind in a New York hospital a year before. A large amount of hemorrhage, however, must diminish the hopefulness of the prognosis, and with separation of the retina there is of course little to be expected. Still, a case reported by Brecht* proves that even with the latter there may be a favorable ending. The extensively separated retina resumed its normal position, and vision gradually rose to $\frac{1}{20}$ in one eye, $\frac{1}{100}$ in the other.

The prognosis as to life can hardly be formed with any more definiteness from a consideration of the presence or

* Archiv für Ophthalmologie, 18, page 2.

absence of retinitis. The cases already referred to tend to show this. Only when there is large hemorrhage evident it may be fairly said that the prognosis is not so good.

Retinitis may accompany any of the affections of the kidney usually classed under the title of Bright's disease. It seems to be most common with chronic interstitial nephritis, but it occurs also with fatty or amyloid degeneration and with acute nephritis. Evidence that would connect either of the varieties of nephritis with any special form of retinitis is at least imperfect, though probably apoplectic retinitis is more often due to interstitial nephritis, with which hemorrhages elsewhere are so likely to occur, and there is so often hypertrophy of the heart. Nor does the presence of retinitis allow any valid deduction as to the stage of the renal affection.

Traube's theory, that increased tension of the arterial system, secondary to hypertrophy of the left ventricle, is the exciting cause of the retinitis, may be true to a certain extent; but in many cases, certainly, no affection of the heart exists.

Johnson's theory, that in Bright's disease there is muscular hypertrophy of the walls of the arteries generally, except in the cranium, would have much the same bearing.

The anatomical changes in the retina consist of hemorrhages in the nerve fibre and deeper layers; exudation of serum; proliferation of connective-tissue elements, with subsequent fatty degeneration; sclerosis of connective tissue and nerve fibres. The radial fibres may be enlarged both in thickness and in length; they may become condensed, homogeneous, more strongly light-refracting, that is, sclerosed; or undergo fatty degeneration; or extend backward so as to destroy the rods and cones and epithelial pigment layer. The connective-tissue cells proliferate and become fatty. In general, fatty degeneration is greatest in the granular layers. The adventitia of the vessels may be thickened and the walls of the larger vessels and capillaries sclerosed.

Hulke* has observed hypertrophy of the muscular coat of

* *Lancet*, I., 1872, page 794.

the arteries. The nerve fibres are often sclerosed, the fibre sometimes being thus affected for a considerable distance, sometimes undergoing sudden local enlargement, which led the earlier observers to regard the change as situated in the ganglion cells. The sclerosis may affect a number of fibres over a circumscribed space, or be more diffused. There may be also a simple thickening of the nerve-fibres without the peculiar brilliancy of sclerosis. Fatty degeneration of ganglion cells occurs.

The cells of the epithelial pigment layer may lose their pigment or proliferate. In the choroid there may be sclerosis of the walls of the capillaries, with or without decoloration of the epithelial pigment in front. Müller described in one case a proliferation of the inner lining of the smaller arteries.

The white patches in the retina are due, chiefly at least, to one of two conditions: fatty degeneration of radial fibres or connective tissue cells, or sclerosis of nerve-fibres or the inner ends of radial fibres. There is no positive means of distinguishing ophthalmoscopically between these two conditions, unless, indeed, there be, as I have seen in a few instances, brilliant, sparkling dots in or upon the white patches. It is no unwarranted assumption to consider these sparkling dots due to the presence of crystals of cholesterine or tyrosine, and therefore as showing fatty degeneration.* Still even then sclerosis may be present also. If the patches can be made out to lie in front of, or on a level with, a retinal vessel, they may be due to sclerosed nerve-fibres, or sclerosis or fatty degeneration of the inner ends of the radial fibres; if they lie behind a vessel of moderately large size, they are probably owing to fatty degeneration.

The white radiating figure about the macula is readily

* Since this paper was written Treitel has published in the *Archiv für Ophthalmologie* (B. xxii., Abth. 2), an account of the microscopic examination of a case of retinitis from Bright's disease in which sparkling points, supposed to be cholesterine, were seen upon the white spots in the retina during life. He was unable to discover cholesterine or other special product to account for them, however, and inclines to attribute them to collections of granular corpuscles in the anterior layers of the retina.

explained by the anatomical arrangement of the nerve-fibre layer and of the radial fibres at this part.

Possibly the want of correspondence between the amount of visible change and the disturbance of vision may in some degree be explained by the different character of the pathological degeneration. Fatty degeneration or sclerosis of the connective tissue need not necessarily cause more than local interference with vision; sclerosis of nerve-fibres must, if extensive, have a much more fatal influence.

That this explanation is insufficient for all cases, however, is shown by the fact that in neuritis and neuro-retinitis generally, when there are no white patches, the degree of visible change and of visual impairment bear no definite relation to each other.

Even the pathology of albuminuric retinitis has no absolutely typical character. Not only the white patches and the radiating figure about the macula, but also hypertrophy of connective tissue, fatty degeneration and sclerosis both of nerve-fibres and of radial fibres are found in retinitis from other causes, such as cerebral tumor, for example.



W. P. Bolles lith.

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A CASE OF LARGE RENAL CALCULI.

By C. ELLERY STEDMAN, M. D.

[With drawings on stone by W. P. Bolles, M. D.]

Mr. J. H. C—, aged 65, consulted Dr. Cushing, of Dorchester, for the first time, a year before entering the hospital, on account of extreme weakness, palpitation, œdema, profuse pale urine frequently voided, of a specific gravity 1010°; six months afterwards, the urine contained albumen. There was no pain.

He was admitted to the hospital on the 28th of December, 1874, and stated that his father died of "asthma," his mother of old age. He claimed always to have enjoyed good health till July, 1874, when he was attacked with great weakness and frequent micturition. Soon after this he noticed swelling of the face and feet. He never had any headache, nausea, vomiting, pain, or disturbances of vision. The bowels had always been regular, and the urine was of a lighter color than it used to be. He complained of frequent palpitation, dyspnœa, and, at times, urgent cough and scanty expectoration. On examination there was noted œdema of the feet and ankles, with puffiness under both eyes; dulness over the lower portion of both backs with fine râles; the rest of the chest was reported normal. Tongue, clean; appetite, good; bowels, regular; pulse, good; dyspnœa on exertion; sleep, poor; temperature, 99.2°; pulse, 84; urine, pale; specific gravity, 1011; alkaline; a slight amount of albumen; of pus and mucus, a considerable amount. — January 8, 1875, the patient was discharged.

On leaving the hospital he came under the care of the writer, who found him out of bed, but keeping his room. He passed much pale albuminous urine, and complained of

great feebleness. There was little œdema, and a good pulse, though there was increased cardiac dulness, and no heart-sounds could be heard; he did not complain of pain. He died suddenly on the 2d of February, 1875.

At the autopsy the heart was found hypertrophied and dilated, with four ounces of serum in the pericardium. The right kidney was hardly more than a cyst, holding two large stones and many smaller ones, as figured in Dr. Bolles's accurate drawing. The left kidney was represented by a little thin kidney tissue, drawn like a membrane tightly over the great calculus, the exact size of which is shown by the two views given in the sketch. The large processes fitted into the calices; the small tail-like projection represents the opening of the ureter. The bladder was contracted, thickened, inflamed, and contained no foreign body.

Fragments of the calculi are said by Professor E. S. Wood to consist entirely of the ammonio-magnesian phosphate.

The family of this patient never heard any complaint of pain from him, nor was any elicited by the questions of his physicians. He appears to have carried this quarry in his loins without any symptoms whatever until six months or perhaps a year before his death.

DISEASE OF THE BRAIN IN ITS RELATION TO INFLAMMATIONS OF THE EAR.

BY J. ORNE GREEN, M. D.

That a purulent discharge from the ear might occasionally cause necrosis of the bone in which that organ is imbedded, and that this necrosis might cause fatal disease of the brain has been recognized for a very long time by pathologists. That such a purulent otitis might become the direct cause of death without the bone becoming diseased has been known only of late years. The dissection of pathological specimens has shown, however, that necrosis is not the only thing to be feared in these cases, but that, even if the petrous bone is unaffected, the disease of the ear may be the direct cause of death.

The anatomical relations of the ear, as shown by the most recent investigations, prove that the ear is in more intimate connection with the brain and other important parts than had been supposed. By means of the microscope and fine injections it has been shown that the numerous small foramina with which the temporal bone is perforated furnish passages through which an inflammation may extend to other parts.

Troeltsch says, "Not only the true diplœ, but the bone of the os temporis in general, is in direct connection, by means of its blood-vessels, with the dura mater on the one hand and with the soft parts of the ear on the other. The temporal bone in general receives its blood-vessels from within and from without, and also sends them in both directions, not only to the dura mater, but also to the membranes lining the outer and middle ear. Diseases of the latter produce abnormal conditions in the bone and its vessels, which, either through the contents, or along the tissue of the

walls of the blood-vessels, pass on to the dura mater, and there cause secondary pathological processes. These announce themselves in the one case by purulent inflammations of the brain membranes, or of the walls of the sinuses; in another, by clot formation and closure of the calibre of the vessels, or by the entrance of putrid matter into the circulation. That all of these processes, developing themselves within or on the vessels, can be produced by the purulent inflammation of the soft parts of the ear without the existence of a 'caries of the petrous bone,' cannot often enough be impressed upon the practitioner, since many are inclined to fear only a caries of the petrous bone, not, however, a simple otorrhœa or purulent inflammation of the soft parts of the ear."

The whole upper and inner surfaces of the petrous bone lie in direct contact with the meninges of the brain, being covered with the dura mater which here serves as a periosteum and nourishes the bone. Part of the upper surface forms the roof of the tympanum, is variable in thickness, but frequently so thin as to be nearly transparent, and occasionally is partially wanting from congenital defect.

The lateral sinus, a fold of the dura mater, and like it serving as a periosteum, is only separated from the mastoid cells by a thin lamella of bone, through which often many minute foramina pass directly into the cells which constitute part of the tympanic cavity. The posterior temporal vein of the *diplœe* of the skull enters the lateral sinus. In addition to this the mastoid foramen serves for the passage of a vein from the scalp into the lateral sinus, so that through these two veins we have the venous circulation of the *diplœe* and of the scalp in direct connection with that of the brain. The facial nerve in its Fallopiian canal passes directly through the tympanum, is never separated from that cavity by more than a very delicate, bony plate, and frequently from a deficiency in this plate, probably due to an arrest of ossification, lies in direct contact with the mucous membrane lining the tympanum.

The floor of the tympanum is formed by the jugular fossa, in which lies the internal jugular vein; in this floor is a foramen through which a branch of the *vagus* passes into

the tympanum. Occasionally at this spot also, from an arrest of ossification, the coverings of the jugular vein lie in direct contact with the mucous membrane of the tympanum.

The anterior wall of the tympanum is formed by the carotid canal, is so thin that light passes through it readily, and is, moreover, perforated by foramina, through which the tympanic branches of the sympathetic pass from the carotid plexus to the tympanum.

The meatus internus gives a large canal from the cavity of the skull to the labyrinth of the ear, and this latter is separated from the tympanum only by the thin membranes covering the fenestræ, ovalis and rotunda, through which the blood-vessels of the tympanum and labyrinth communicate by anastomoses. This large passage is lined by a prolongation of the dura mater, which serves as its periosteum. The aquæductus vestibuli also connects the interior of the skull with the cavity of the labyrinth, and serves for the passage of a small vein.

The petrosal-mastoid canal leads from the mastoid cells to the interior of the skull, thus furnishing still another communication from a different part of the tympanum to the brain. It serves for the passage of a vein which has been followed into the superior petrosal sinus, so that we have the circulation of the tympanum here in direct communication with that of the meninges of the brain.

When, in addition to these anatomical relations and connections, it is remembered that the mucous membrane which lines the whole tympanum is so intimately connected with the periosteum that the two cannot be distinguished, or, in other words, that the mucous membrane of the tympanum constitutes, in fact, the periosteum on the interior of the petrous bone, the only wonder is that disease of the brain is not a more frequent sequel of inflammation of the ear than it is.

The inflammations of the ear from which, as experience teaches, disease of the brain arises, consist essentially of a suppurative inflammatory process of the mucous membrane which lines the whole tympanic cavity;—in fact, a periostitis of the interior of the petrous bone.

It is unnecessary here to speak of the symptoms and appearances of a purulent inflammation of the tympanum; we are concerned only with the fact that, as the result of this inflammation we have the tympanic mucous membrane intensely inflamed, secreting pus, often in large quantities, and with a very great tendency to ulceration. The purulent inflammation of the tympanum generally involves the mucous membrane of the whole cavity; that is, both the tympanum proper and the mastoid cells. But this is not necessarily the case; sometimes the inflammation is confined to the tympanum proper, and a few rare cases have been reported in which the mastoid cells alone were involved.

The usual course of such an inflammation is as follows: the pus secreted in the tympanum gradually fills that cavity, ruptures through the drum-membrane and discharges itself into the external meatus. This evacuation of the pus is followed, in favorable cases, by a subsidence of the inflammation of the mucous membrane, a gradual cessation of the secretion, healing of the perforation and a restoration to the normal condition of all parts of the tympanum. If the mastoid cells are involved they also become filled with pus; but, as the inflammation of the tympanum proper subsides after rupture of the drum-membrane, the inflammation of the cells also subsides and this pus is absorbed. The deviations from this usual course of the disease are: retention of the pus in the tympanum proper, owing to abnormal thickening of the drum-membrane, which resists rupture, or owing to the rupture being insufficient to thoroughly evacuate the cavity; affection of the bone in any part from the inflammation of the mucous membrane which serves as periosteum; extension of the inflammation along some of the channels of communication already mentioned.

While the usual course of such an inflammation, even when complicated as just described, is favorable, as far as the brain is concerned, there are certain risks to which that organ is exposed; namely, (1) the danger of an extension of the inflammation *per continuitatem* along some of the avenues of communication already described, this extension of the inflammation being aided by the pressure of the pus confined

in the bony cavity ; (2) the danger of invasion of the neighboring tissues from extension of the inflammation *per contiguitatem* ; (3) the danger of a decomposition of the confined pus, causing phlebitis in any of the veins communicating with the brain. As the result of the two former dangers we may have an ostitis of the bone, caries or necrosis, either very circumscribed or extensive, or a circumscribed inflammatory softening and absorption of the bone.

The diseases of the brain which follow inflammation of the ear are either meningitis, encephalitis, phlebitis or thrombosis of the sinuses or jugular vein.

Acute meningitis may result from an extension of the inflammation of the tympanum *per continuitatem* along the minute blood-vessels which connect the circulation of the ear with that of the brain ; or it may result from the direct irritation of a caries either of the roof of the tympanum or of the inner wall of the mastoid, or from the rarer cases of caries of the whole petrous bone. The penetration of the purulent matter into the labyrinth by ulceration or rupture of the small fenestræ, and thence along the meatus internus or aquæductus vestibuli, is also a not infrequent cause of meningitis.

The meningitis caused by an inflammation of the ear does not differ essentially in its anatomical features from that arising from any other cause : it may extend over the whole surface of the cerebrum, or be limited to the surface in the neighborhood of the diseased ear, or, more commonly still, it is confined to the base of the brain. Its connection with the ear, although not always conspicuous, can generally be traced by examining carefully the points at which the ear communicates with the brain. It will often be found that in the neighborhood of the petrous bone the congestion is more marked than in other parts of the meninges ; often that, in this neighborhood, the inflammation is in a more advanced stage than over the rest of the meninges ; that while over the general surface of the base of the brain or cerebrum the inflammation is in the early stage of congestion, near the petrous bone it has already gone on to the deposit of lymph, or has become purulent. After the removal of the brain, an

examination of the petrous bone will often establish most satisfactorily the source of the inflammation; for the dura mater over the bone will be found intensely inflamed at the spot of communication with the ear, and not infrequently an incision will develop a minute quantity of pus lying between the dura mater and the bone. The points at which this is most likely to be the case are either the upper surface of the petrous bone, over the roof of the tympanum, or the orifice of the aquæductus vestibuli on the posterior aspect of the bone between the lateral sinus and the meatus internus, or the meatus internus. In the cases where the ear has become more seriously diseased, the connection of the meningitis with that organ is generally so marked that it can scarcely escape even a superficial examination. If the petrous bone has become carious, or been perforated, there is generally a well-marked deposit of lymph or pus around the diseased bone, and often the cerebral surface of the dura mater is so firmly attached to the bone that it can only be separated with difficulty. Sometimes the dura mater over the diseased bone is found perforated from ulceration. By stripping the dura mater from the bone, any inflammation, perforation, or caries of the bone is to be seen distinctly. The congenital defect in the roof of the tympanum which is occasionally found would, of course, favor the extension of an inflammation from the ear to the meninges, as the dura mater would then lie in direct apposition with the mucous membrane of the tympanum.

In some cases, in which death has been caused either by some other disease of the brain than meningitis, or by some general disease, it is interesting to see how the brain has been protected from injury even where the petrous bone has become carious to a great extent. As the result of a slow, long-continued inflammation of the ear and petrous bone, the dura mater over the bone becomes greatly thickened and affords a firm barrier to the extension of the inflammation. On this account a chronic inflammation of the ear, extending over years without acute exacerbations, is less to be feared than one which, however long continued, takes on suddenly an acute character from exposure or some other cause, and

subjects the patient to the risks of an increased pressure of pus and renewed ulceration. In these cases where the meninges seem to be protected by the thickening of the dura mater, and yet a fatal meningitis has been set up by the ear, it will not infrequently be found that the acute exacerbation has caused a purulent inflammation of the labyrinth, and this has extended to the meninges though the meatus internus along the auditory nerve.

Whether disease of the ear is ever the cause of a chronic meningitis is uncertain. I have never seen it spoken of as such, and am not aware of any observations which point toward such a connection between an inflamed ear and the opaque, thickened arachnoid found in chronic meningitis.

Phlebitis and thrombosis as the result of inflammation of the ear may occur primarily either in the sinus lateralis, the sinus petrosus superior, the sinus petrosus inferior, or in the internal jugular vein. The close relation and connection of these veins with the tympanum have been already mentioned.

The lateral sinus is liable to inflammation from an extension of the mastoid inflammation along the minute blood-vessels which supply the bone between the cells and the sinus, and which fill the minute foramina observed on a macerated bone; or it may become inflamed from a caries of the bone on the inner wall of the mastoid cells; or from an inflammation of the bone of the mastoid (ostitis), which, by causing a phlebitis of the veins of the *diplœ*, would by extension affect the lateral sinus through the chief vein of the *diplœ*, already mentioned.

The superior petrosal sinus may become inflamed from an extensive caries of the petrous bone, or from a circumscribed inflammation or caries of the tympanic roof, or finally from an extension of the inflammation of the mastoid cells along the petrosal-mastoid canal, which conveys a vein from the mastoid cells directly into the petrosal sinus. It may be affected secondarily from an extension of a thrombus or phlebitis of the lateral sinus.

The inferior petrosal sinus, although not in direct connection or relation with the ear, may become inflamed from an extensive caries of the petrous bone, or from an inflammation

or caries around the orifices of the aquæductus vestibuli or meatus internus, or secondarily by extension of the disease from the other sinuses.

The jugular vein is liable to inflammation from the same causes as the lateral sinus, although not so frequently affected as the sinus. The tympanic inflammation may extend along the minute foramina in the bone, which gives passage to minute nerves and blood-vessels, and thus cause a phlebitis of the jugular; or the bone between the tympanum and the jugular fossa may become carious; or finally there may be a congenital defect in the bone at this point which places the inflamed mucous membrane of the tympanum in direct apposition with the coverings of the jugular vein. Finally, like the sinuses, the jugular may be affected secondarily from an extension downwards of an inflammation in the lateral sinus.

Encephalitis from disease of the ear is always found, in its most advanced stage, as abscess of the substance of the brain. The position of the abscess varies very much, and in some cases its connection with the ear-disease is by no means easily made out. The most frequent position of the abscess is in the cerebral hemisphere next the diseased ear; it may be on the lower surface of the hemisphere directly over and communicating with a caries of the tympanic roof; or it may be in the substance of the hemisphere, with a portion of healthy brain-tissue between it and the diseased bone; or, in very rare cases, it may be in the substance of the cerebral hemisphere on the opposite side from the ear-disease. The next most frequent position of the abscess, after the cerebrum on the side of the ear-disease, is the cerebellum on the side of the ear-disease; and, as in the cerebrum, the abscess may be here on the lower surface, or in the substance of that organ. These abscesses may be either single or multiple, and in the latter case they may all be in one hemisphere, or they may be in different parts of the brain.

Meyer,* in his exhaustive monograph on the pathology of abscess of the brain, gives an excellent description of encephalitis from otorrhœa. He reports that of 80 cases of supuration of the brain recorded by Lebert, 20 were caused by

* Zur Pathologie des Hirn-Abscesses von Dr. Rudolph Meyer. Zurich, 1867.

otorrhœa; of 40 cases of Schott's, 13 were due to otorrhœa, while of his own, 86 cases, 20 were caused by otorrhœa. This gives of 206 cases of abscess, 53 from disease of the ear, which is nearly the proportion caused by injuries, as an analysis of the same statistics shows that in one-fourth of the cases the abscess was the result of injury of the head. Suppuration of the cerebrum occurs very frequently (10 times in 19 cases), and the right hemisphere is its most frequent seat (9 times in the 10 cases), as would be expected from the fact that the right petrous bone was found more frequently diseased than the left one (14 cases, right; 4 cases, left). Whether otorrhœa is more frequent on the right side than the left is unfortunately not known; but it should be stated that several observers have already called attention to the above fact. In only two cases did multiple abscesses follow caries of the right petrous bone. In the first of these cases one abscess was in the cerebrum and the other in the cerebellum; in the second case there were three abscesses in the cerebellum. Usually, it is only a chronic otorrhœa which leads to suppuration of the brain; for of nineteen cases there was only one which arose from an acute otitis. Not infrequently a chronic catarrh of the mucous membrane of the external meatus or of the tympanum causes a polypoid hypertrophy of the mucosa on the one surface, and a chronic inflammation of the neighboring bone on the other surface. The caries of the petrous bone, thus produced, causes an inflammation and close adhesion of the dura mater, and from here the inflammation glides into the deeper parenchyma of the brain, sometimes in such a way that the dura mater forms the anterior covering of the abscess, sometimes so that the abscess remains concealed deep in the parenchyma. Frequently, fistulæ exist between the abscess in the brain and the suppurating bone; but this is not always the case; it is by no means necessary that the dura mater and the bone should be in any way defective. Gull calls attention to the fact that perfectly healthy brain-tissue may lie between the abscess and the diseased bone, and that then we must suppose that the abscess of the brain occurs in the way that it does, not infrequently, from inflammation of still more

distant parts. This origin of the abscess by metastasis from an otorrhœa is by no means impossible, yet it is certainly exceptional; at least, in Meyer's cases there are no examples of the abscess being on the opposite side from the ear disease.

In a case of caries of the petrous bone it is not always possible to distinguish between a thrombus of the lateral sinus and an abscess of the brain; the two diseases combined are found in one of Meyer's cases, where the bone on the posterior surface of the petrous bone was diseased and had given rise to polypoid excrescences on the anterior wall of the sinus. The seat of the abscess in the brain depends in a great measure on the position of the affection of the bone, and quite regular laws can be established, as Toynbee first showed. According to him the retention of the otorrhœal products is the chief cause of the extension of the inflammation inwards. Each division of the ear transmits its disease to a certain region of the brain, the meatus auditorius externus to the lateral sinus and the cerebellum, the tympanum to the cerebrum, and the labyrinth to the medulla oblongata.

Gull* considers that these rules of Toynbee's require the confirmation of further observations, and narrates one of his own cases, where the inflammation extended from the tympanum, but death resulted from an abscess of the cerebellum, which latter depended on a phlebitis of the vena aquæductus vestibuli. Another exception to Toynbee's law is furnished by another case of Gull's, in which an acute inflammation of the lateral sinus resulted from caries of the roof of the tympanum and mastoid. Gull therefore modifies Toynbee's law, and considers that the cerebellum and lateral sinus may suffer from disease of the mastoid, while the cerebrum is endangered by caries of the tympanic roof. In the beginning of a case it would naturally be impossible to prognosticate the course of the disease.

That Gull's modification of Toynbee's law is a just one is shown by other cases. In one case of otorrhœa which fol-

* Guy's Hospital Reports, 3d Series, Vol. III. Meyer, l. c.

lowed measles in childhood, and had existed for forty-three years, a purulent inflammation of the tympanum, with a polypoid growth, caused a thickening of the osseous roof of the tympanum, and not a disease of the cerebrum, as Toynbee would have expected; but the pus was forced through the fenestra ovalis into the labyrinth, and from here followed the auditory nerve through the meatus internus to the cerebellum; the auditory and facial nerves were disorganized by purulent inflammation, and in the left lobe of the cerebellum was an abscess of the size of a walnut, separated from the meninges by a thin layer of brain-substance. The abscess of the cerebellum can result from an otorrhœa without a perforating caries of the bone, both by extension from the labyrinth along the vena aquæductus vestibuli, the auditory or the facial nerve, and also by extension from the mastoid cells. A third possible origin is the posterior wall of the external meatus, as occurred in a case of Hughlings Jackson and Hutchinson*: here a fistula was found between a carious petrous bone and a large abscess in the anterior part of the right cerebellum, the anterior wall of the abscess being formed by the perforated dura mater and the posterior wall by a firm membrane. In this case, an interesting fact was the existence of a smaller encysted abscess directly behind the first, and a larger, not encysted, purulent collection on the inner side and parallel with the other two.

The abscess of the cerebrum in otorrhœa always is caused by a caries of the tympanic roof; often the lamella of bone has been destroyed by suppuration. In one case, the abscess was between the tentorium and the right posterior lobe; but generally it lies deeper in the cerebrum, and is separated from the carious bone by a layer of brain-substance.

Meyer's tables, giving the age at which abscess of the brain was found, and especially showing the influence of otorrhœa, are of special interest:—

* Cases of abscess in the Brain. Medical Times and Gazette, Feb. 23, 1861.

3 between 1-10 years of age. (1 traumatic; 1 otorrhœal.)			
12	"	10-20	4 " 2 "
18	"	20-30	2 " 6 "
11	"	30-49	8 " 3 "
15	"	40-50	2 " 1 "
7	"	50-60	1 "
5	"	60-70	
71		17	" 14 "

Another of his tables showing the causes of the abscesses is as follows :—

Typhus	1
Intracranial tumor	2
Acute pyæmia	2
Disease of nasal mucous membrane	3
Disease of the blood-vessels	5
Inflammation of neighboring parts of the brain	5
From unknown causes	11
Suppuration of distant organs, especially the lungs	19
Caries of the petrous bone	20
Injuries	21
Total	89

Hæmorrhage within the cranium, due to inflammation of the ear, has never been found except from the lateral sinus, caused by caries of the mastoid and a perforation of the sinus by ulceration. Whether it ever could occur from either of the petrosal sinuses is doubtful, as from their smaller size they would be liable to become closed by the formation of a thrombus before their walls had been perforated. Hæmorrhage from the lateral sinus may be either external into the tympanum and meatus, or internal into the cranial cavity. Wreden* has described a case, fatal from two perforations of this sinus, through one of which the hæmorrhage was external and through the other internal; he has also given a synopsis of eighteen such perforations of the sinus from various authors.

* Monatschrift für Ohrenheilkunde. No. 10. 1869.

One class of cases, just the reverse of those which we have been considering, remains to be mentioned, namely, that in which the inflammation of the brain is the primary disease, and the inflammation of the ear is secondary. Observations are wanting as yet to show that this ever occurs, except in cerebro-spinal meningitis. In this disease, however, it has been demonstrated, post-mortem, by Moos,* that the purulent inflammation of the meninges may extend along the auditory nerve in the meatus internus, and set up an inflammation of the labyrinth of the ear, or may even extend so far outwards as to set up a purulent inflammation of the tympanum also.

The differential diagnosis between the various forms of brain-disease caused by inflammation of the ear is always difficult, and often impossible, from the fact that meningitis, phlebitis and encephalitis frequently exist together.

Meningitis, in its pure form of inflammation of the pia mater, is never found as the result of ear-disease, but is always associated with, and the result of, an earlier pachymeningitis or inflammation of the dura mater.

Phlebitis of the sinuses is also usually associated with pachymeningitis from the inflammation of the walls of the sinus extending into the dura mater. This, however, is not necessarily the case, for the dura mater may escape inflammation, and the thrombus within the sinus, by breaking up or suppuration, lead to emboli in distant parts, or to purulent infection.

I cannot better show the important part which inflammation of the ear plays in the production of these diseases, and the complicated character of their symptoms, than by the following quotations from Niemeyer † : —

"It is very doubtful whether pachymeningitis externa ever appears as a primary and independent disease, the result of cold or other injury. Certainly, as a rule, it is a secondary affection, associated as such with fissures and fractures, and particularly with caries of the cranial bones, especially of

* Pathological Anatomy of the Ear. Archives of Ophthalmology and Otolaryngology. Vol. III., No. 2, page 177.

† Pathologie u. Therapie. Vol. II., page 225.

the petrous and ethmoid bones, or with caries of the upper cervical vertebræ. A pachymeningitis is also sometimes developed in the course of a periostitis of the external cranial surface without one being able to recognize the continuity of the two processes by changes in the cranial bones. An inflammation of a sinus of the brain with resulting thrombus, or a thrombus of the sinus causing eventually an inflammation of its walls, is comparatively common; it occurs most frequently in those sinuses lying in apposition to the petrous bone, the sinus lateralis and the sinus petrosus superior and inferior. This is easily explained, from the fact that an inflammation and thrombus of a brain sinus is caused in the great majority of cases by caries of the petrous bone, which has extended to the base of the skull. The danger of an inflammation and thrombus of these sinuses hangs, like the sword of Damocles, over the numerous patients who suffer from chronic otorrhœa and caries of the petrous bone, the result of an otitis interna. Not infrequently the thrombus passes into purulent degeneration, and, by its particles passing into the evacuant veins, leads to emboli and metastatic inflammations.

“The anatomical changes in light or chronic cases of pachymeningitis externa are confined to a gradual thickening of the dura mater, the result of a growth of connective tissue on its external surface; by this growth the dura mater is firmly attached to the skull; and, later, the layer of newly-formed connective tissue becomes partially ossified. In acute and severe cases the dura mater becomes reddened, thickened, and œdematous from an injection of the vessels and small ecchymoses, usually on a circumscribed spot corresponding to the seat of injury, or the caries of the bone; later, it is discolored, its tissue becomes loosened and softened, and finally passes into suppuration, which, when the pus collects between the dura mater and the bone, leads to a separation of the inflamed spot from the bone lying beneath. In this latter case the pia mater is almost always likewise inflamed over a large portion of its surface. At an autopsy it is often difficult to distinguish whether the inflammation of the wall of the sinus preceded the thrombus, or

the thrombus the inflammation of the sinus-wall. If the thrombi are not degenerated and broken up, they adhere firmly to the loosened, raw inner surface of the thickened wall of the sinus, and from here extend sometimes backwards to the torcular Horophili, and in some cases downwards to the internal jugular, as Lebert, who has chiefly contributed to the better recognition of this disease, has shown. More frequently, at an autopsy, the thrombus is found already broken up, and the sinus filled with a purulent, sometimes grayish-green, and offensive fluid, mixed with flocculi. In addition to these changes those of an otitis interna and extensive caries of the petrous bone are also found; viz., destruction of the membrana tympani, loss of the ossicula, polypoid growth of the mucous membrane, the tympanum and mastoid cells filled with pus and the labyrinth and cochlea infiltrated.

"The chronic pachymeningitis which leads to thickening of the dura mater, its firm adhesion to the skull and ossification of its thickened layers, may be accompanied by headache and other symptoms; but these symptoms are not characteristic and distinctive of the disease. The symptoms and course of an acute pachymeningitis are also so often modified by the symptoms of the primary disease, by the complication of an extended inflammation of the pia mater, and by an extension of the inflammation to the sinuses, that it is impossible to give a clear picture of the disease by itself. If, during an injury to the skull or an otorrhœa dependent on caries of the petrous bone, unusually severe and extensive pain comes on in the neighborhood of the affected bone with febrile disturbance, vomiting, dizziness, subjective noises in the ear, twitchings, delirium, and other symptoms of irritation of the brain, and, later, symptoms of depression and general paralysis, we may assume that the disease of the skull has led to an inflammation of the dura mater, and, later, to diffuse inflammation of the pia mater. The earlier symptoms are often very short and slight, and the patient is found at the first visit, or on his reception at the hospital, in a deep sopor. In such cases, however, the diagnosis can be made with tolerable certainty if an injury to the skull, or,

especially, if a chronic otorrhœa can be discovered, and the other causes of brain disease are wanting."

"The symptoms of inflammation and thrombus of the brain sinuses are always united with the above symptoms of meningitis, as are frequently, also, those of an encephalitis.

"In most cases, only the appearance of chills and of metastatic collections in the lungs allows us to determine with certainty that a caries of the petrous bone has led not alone to a meningitis and encephalitis, but also to the formation of a thrombus in the sinuses."

The symptoms of phlebitis and of thrombosis of the sinuses, which had been insisted upon by Gerhard as pathognomonic of the disease, have been proved by later observations to be of no value. Gerhard laid special weight on the lesser distention of the jugular vein which came from the closed sinus than that of the opposite side; but Schwartze* has described a case in which exactly the opposite condition existed; the jugular on the side in which a large thrombus existed in the longitudinal, lateral and petrosal sinus being more distended than the vein on the opposite side.

Griesinger considered that a painful œdema over the mastoid was diagnostic of the disease, owing to an extension of the thrombus through the vein which leads from the lateral sinus through the foramen mastoideum to the outside of the skull. As will be shown later, the observations of Wreden confirm this as a symptom of phlebitis of the lateral sinus. Schwartze insists, even more strongly than Niemeyer, that the diagnosis of phlebitis and thrombus of the sinuses from disease of the ear can be made with certainty only when pyæmic symptoms are present; *i. e.*, irregularly recurring chills and signs of metastatic deposits in the lungs, spleen, kidneys or joints.

It will be seen from the quotation from Niemeyer that he speaks often of the existence of caries of the bone as the cause of the inflammation of the brain, and would seem to imply that that alone was to be feared. Observations of later years have proved, however, that caries of the bone is by no means necessary for an extension of an inflammation of the ear to the brain; but that numerous channels of com-

* Archiv für Ohrenheilkunde, Vol. VI., page 219.

munication between the ear and brain exist, as shown in the earlier part of this paper, along which a simple inflammation may extend. In three cases of phlebitis and thrombosis of the lateral and petrosal sinuses, due to ear-disease, reported by Schwartz*, one showed no caries of the bone; and in six cases, by Wendt, caries existed in only five.

Wreden† differs from Schwartz and Niemeyer, and claims that the diagnosis of phlebitis and thrombosis of the cerebral sinuses is by no means as difficult and uncertain as has been supposed. He has analyzed one hundred and fifty-one cases by various authors, and points out the necessity of a separation, pathologically, of the different cerebral sinuses, and considers that the little practical use which has been made of our knowledge of inflammation and thrombosis of these sinuses has been due not to the nature of the disease, but to the unscientific use of the cases heretofore reported, in that authors have not properly considered (1) the strict difference between thrombosis and phlebitis; (2) the pathological or, more strictly speaking, the anatomical, differences of the cerebral sinuses.

Thrombosis must be due to mechanical influences which retard the passage of the blood in the sinus, as (1) a diminution of the propulsive force of the heart (marantic form); (2) incomplete emptying of the right heart, in consequence of impeded expansion of the lungs (form due to back pressure); (3) narrowing of the calibre of the sinus in consequence of the pressure of tumors, foreign bodies, etc. (compression thrombosis); (4) coagulations in a number of the afferent or large efferent veins (by extension). It is not accompanied by fever, and produces no pyæmic symptoms.

Phlebitis, however, arises (1) from the propagation of inflammatory processes (*per contiguitatem*) from the vicinity of sinuses to their own walls; (2) from direct traumatic injury of the walls; (3) by transference of the phlebitic process (*per continuitatem*) from single large veins that communicate with it. It is accompanied by violent fever,

* Loc. cit.

† Saint Petersburger Medicinische Zeitschrift, Vol. XVII.; Archives of Ophthalmology and Otology, Vols. IV. and V.

and very often gives rise to pyæmic or even septicæmic symptoms.

The history of the case with the predisposing disease, if any existed, but more particularly the violent fever and the pyæmic symptoms, render the differential diagnosis between the two conditions comparatively easy.

Thrombosis of the cavernous sinus shows itself by a congestion of the vein which empties into it, the ophthalmic, and its branches; these branches are the supra-orbital, muscular and lachrymal, ciliary, anterior and posterior nasal, ethmoid, frontal and infra-orbital. As the result of the congestion of these veins, there is, on the affected side, cedematous swelling of the nostril, forehead and eyelid, mechanical hyperæmia of the retina, with diminution of vision, and also swelling of the nasal mucous membrane with bloody discharge. If a phlebitis of the cavernous sinus exists, in addition to the above symptoms of congestion from the thrombus, which would almost necessarily be present, there are also the phenomena of irritation and paralysis of the abducens, the ophthalmic branch of the fifth and the oculo-motorius nerves, due to the swelling of the walls of the sinus and of the neighboring tissues which press upon these nerves. The affection of the abducens which lies close to the outer wall of the sinus shows itself by paresis of the external rectus, causing an internal squint; that of the ophthalmic branch of the trifacial, which lies close to the sinus below and outwards, by headache especially in the forehead and over the eye (supra-orbital nerve), epiphora (lachrymal nerve) and photophobia (reflex irritation or hyperæsthesia of the optic nerve); that of the oculo-motorius, which lies over the upper and outer wall of the sinus, by paralysis of the upper eye-lid with inability to open the eye (ptosis).

Thrombosis of the superior longitudinal sinus shows itself by repeated violent hemorrhages from the nose, due to the back pressure in the veins of the nasal cavity which empty into this sinus; and also by epileptiform convulsions, with loss of consciousness, which Wreden refers to capillary hemorrhages in the cortical substance of the convexity of both

posterior cerebral lobes, brought on by the interference with the blood-current from the surface of the brain. The hemorrhage from the nose, Wreden does not consider important in itself, but in connection with the epileptiform convulsions it is very significant. From an analysis of the recorded cases of thrombosis of the superior longitudinal sinus, he finds that all which presented after death hemorrhages in the cortical substance, as described above, were subject, during life, to epileptiform attacks.

Thrombosis and phlebitis of the transverse sinus show themselves by enormous œdematous swelling of the soft parts in and about the external ear, which has exactly the character of phlegmasia alba dolens; there is also apt to be constant dizziness, even in the horizontal position, and staggering. As the phlebitis extends downwards to the internal jugular vein, the external phlegmonous inflammation spreads from the neighborhood of the mastoid downwards to the clavicle; the point of greatest swelling is along the course of the vein, and there is great tenderness on pressure. As the circulation in the internal jugular vein becomes impeded, symptoms of congestion of the facial vein show themselves by a puffy and swollen condition of the face, which, however, may be only transitory; for the facial vein has so many anastomoses with the branches of the external jugular that a collateral circulation is very soon established. If the phlebitis extends up into the facial vein, its larger branches may become plugged, and then will there be enormous œdema of the face; if the inflammation extends into the finer facial branches, a distinct erysipelatous inflammation, with redness, heat and vesicles, is developed in the skin of the cheek and forehead.

With phlebitis of the internal jugular vein there is a remarkable dilatation of the external jugular, with a distinct undulatory increase and diminution in fulness, accompanying respectively expiration and inspiration. This phenomenon is usually only temporary, and depends on the blocking of the collateral circulation.

Clonic and tonic spasms of the sterno-cleido-mastoid and trapezius muscles may result from an irritation of the spinal

accessory nerve in the jugular foramen when pressed upon by a thrombus of the bulb of the jugular vein.

Thrombosis and phlebitis of the superior petrosal sinus cause great congestion in the labyrinth of the ear, with subjective noises, deafness, and especially a great diminution or total loss of perception of sound through the bones (bone-conduction), due to the fact that the veins of the labyrinth drain, at least partially, into this sinus.

From the direct connection of one sinus with another, it would not be expected that any one set of symptoms would alone be observed.

One important fact in regard to the symptoms of meningitis and phlebitis caused by the ear, although mentioned by Niemeyer in the preceding quotation, deserves to be particularly emphasized, — the earlier and more acute symptoms are often of such short duration, or so slight, that they can escape observation.

Meningitis may, and often does, exist alone, uncomplicated by any other form of brain-disease; phlebitis of the sinuses is almost always accompanied by more or less meningitis, while encephalitis, although it may be complicated by meningitis, or by both meningitis and phlebitis, is frequently found without either of these complications.

The obscurity of the symptoms in abscess of the brain is well known, as is also the marked disproportion between the anatomical changes found after death and the clinical symptoms observed during life. This can be explained, at least in a great measure, by the slow growth of the purulent collection, its softness, which consequently produces slight pressure on the healthy portions of the brain, and the fact that the position of the abscess is usually in the white substance of the hemispheres, which plays a comparatively unimportant part in the physiology of the brain.

In abscess of the brain there is also frequently a marked latency in the disease intervening between the initiatory symptoms and the final, fatal ones; total latency of the disease throughout its whole course is, however, rare, but two cases being reported by Meyer. The primary symptoms seem to mark the early period of congestion and begin-

ning softening, while the final ones are found when the abscess has reached a motor centre, or ruptures, or sets up another disease of the brain, as meningitis or extensive œdema.

The beginning of an encephalitis, always difficult to define, is especially so when caused by disease of the ear, for the pain and other symptoms in the ear, although not necessarily present in a serious ear-disease, are apt to obscure the brain symptoms. The more gradual the extension of the ear-disease to the brain, the slower is the primary congestion of the encephalitis, and the less marked the brain symptoms. Slight headache is often the only brain symptom complained of, but as this is a not infrequent accompaniment of the ear-disease, but little reliance can be placed on it unless it becomes very severe, and long continued, without symptoms of meningitis. In two-thirds of Meyer's cases of abscess of the brain, headache, variable but gradually increasing with the length of the disease, was the first symptom noticed; this was sometimes accompanied with fever, dizziness, and occasionally with vomiting, but seldom with convulsions or paralysis. After headache, fever with chills, thirst and loss of appetite would seem to be the next frequent initiatory symptom. Meyer found it in one-eighth of his cases, while convulsions were the first symptom in one-tenth of his cases. The convulsions were usually general, of an epileptic character, and accompanied by loss of consciousness. Neuralgia, anæsthesia, and disturbances of the intellect are rare as early symptoms.

The less severe the initiatory symptoms of encephalitis, the slower, as a rule, is the development of the abscess. The earlier symptoms often disappear entirely, so that for a time the patient is absolutely free from symptoms of any kind. The course of the disease, after the first symptoms, may be either acute or chronic, depending on whether the abscess becomes encapsuled or not; in the acute form, death results from the increasing suppuration and destruction of the brain-substance; in the chronic form, from rupture of the abscess into the ventricles, or upon the surface of the brain, or else from œdema or anemia.

In the acute abscess there is little, if any, latency in the disease ; at the most, the patient is free from symptoms for only a few days, and the disease runs its course and ends fatally in from one to five weeks ; occasionally the period is longer. Meyer found the following as the causes of fourteen such acute abscesses : injury, 6 ; metastasis, 3 ; emboli, 2 ; otitis, 2 ; disease of the nose, 1 ; showing that no one cause specially predisposes to this form of the disease.

The chronic abscess is characterized by a period of marked latency intervening between the earlier and the later symptoms ; this latency is often complete, but is sometimes interrupted by short, remittent attacks of headache. Sometimes the earlier symptoms are wholly overlooked, and the disease runs its course absolutely without noticeable symptoms till the final ones set in. The duration of this latency may vary from a few weeks to several months ; and in two cases, narrated by Bruns and Schott, it was thought to have reached twenty years. The period of latency being once disturbed, the final course of the disease is usually rapid. In thirty-four cases given by Meyer, in which the period of latency and that of the final symptoms was well marked, the latter ran their course and ended fatally :—

Within the 1st week	.	.	.	13
“ 2d “	.	.	.	7
“ 3d “	.	.	.	4
“ 4th “	.	.	.	4
“ 5th “	.	.	.	4
“ 6th “	.	.	.	1
“ 9th “	.	.	.	1

Occasionally an abscess without an enveloping capsule assumes this chronic course ; but this is rare.

In the chronic abscess, death is usually caused from a rupture into the ventricles, or upon the surface of the brain, from an extensive œdema of the brain-substance, from involvement of the medulla oblongata in the disease, or occasionally from anæmia of the brain. Of these different causes, the rupture into the ventricles is the most frequent,

and is followed by symptoms of irritation in the motor centres, febrile disturbance, delirium, limited or general paralysis of motion and sensibility, coma and death. Rupture on to the base of the brain is generally followed so rapidly by profound coma that other symptoms are masked; but sometimes headache, dizziness and vomiting are noticed. Hemiplegia and continuous coma have been noticed from extensive œdema; but the symptoms of all of the above enumerated causes of death are so little distinctive that a differential diagnosis is usually impossible. They all lead to a fatal termination in from a few hours to a few days.

Although the complicated character of the various forms of brain-disease should be borne in mind, still we have many symptoms which enable us to distinguish one disease from the other. In meningitis the following symptoms are usually observed: violent fever, with a very high pulse, especially in the beginning of the attack; severe headache, general and never distinctly circumscribed; violent delirium; contractions of the pupils, and vomiting; convulsions and sopor.

In encephalitis the diagnosis must be very uncertain, as there may be absolutely no symptoms, or—only in the beginning of the disease—symptoms which resemble, and often are due to, meningitis. When the abscess is in certain positions, there may be affections of the sensible or motor nerves, showing themselves as anæsthesias or paralyses. The early history will often help the diagnosis, if it shows the existence of a predisposing cause to encephalitis, such as injury or disease of the ear, and especially if there has been an acute illness with meningitic symptoms. The history of an acute febrile attack, resembling meningitis, with a high pulse and severe general headache, followed by a marked falling of the pulse below the normal, and occasional headache, distinctly circumscribed and in one spot, is often characteristic of encephalitis.

Simple thrombosis of the brain sinuses, from ear-disease, is very rare, as all the conditions predispose to a phlebitis, and not to any mechanical obstruction to the circulation; it can be distinguished from phlebitis by presenting the symptoms of obstruction to the circulation, as described above,

unattended by high pulse and increased temperature ; while a phlebitis of the same sinuses would show, in addition to the same obstruction to the circulation, marked febrile disturbance. The occurrence of pyæmic chills and metastatic deposits in the lungs, spleen or liver, render the diagnosis of phlebitis certain.

NOTES OF CASES OF PLEURISY AND PARACENTESIS THORACIS.

BY HALL CURTIS, M. D.

CASE I. — P. C., aged 32, currier, entered the hospital March 18th, 1873. Family history good. Constitution and general health good. No previous illness. Habits temperate. Four weeks before entrance the patient had two chills, followed by fever, and frequent vomiting. He had a cough, which became severe at once, with half a pint of expectoration in twenty-four hours. For a number of days the sputa were streaked with fresh blood. These symptoms were accompanied with some lancinating pain over the left chest, particularly on coughing and with deep inspiration.

March 21st. Resonance good over nearly the whole of the left back, though there is dulness in its lower portion. The line of dulness varies with the position of the patient; but above the fourth rib, in front, and over the upper portion of the scapula, is a faint, respiratory murmur, accompanied by sub-crepitant râles. Throughout the entire left chest the succussion sound is distinct. On the right side there is dulness from the fourth rib down to the epigastrium, extending from the median line as far as the right nipple, and the heart is felt beating in that situation. Good resonance and exaggerated respiration over the rest of the right lung. The chest was painted with tincture of iodine.

April 8th. The left chest measured seventeen and a half inches; the right, sixteen and three-quarters. The patient was tapped, one inch below the angle of the scapula, and two quarts of clear serum were removed.

April 17th. Some want of tone in the lower portion of the right back. Respiration heard in lower fifth, but indis-

tinged. In the axillary line it still has rather an amphoric character. Discharged, well.

CASE II. — T. T., aged 48, laborer, entered hospital April 16, 1873. His family history was obscure. Patient came to the hospital for the first time about two years ago, and has since been here ten times, on each occasion fluid being withdrawn by paracentesis thoracis. His disease is chronic pleurisy. He is generally warned of an excess of fluid in the left side of the chest by a stitch-like pain there, and by considerable cough. The average time for "filling up" of the chest has been three months.

Patient is now up and about, feeling quite comfortable. Temperature, 98.6°. Left chest completely flat over lower two-thirds, with want of tone in the upper third. By the aspirator half a pint of bloody serum was withdrawn, when the valves of the instrument became clogged and the flow ceased.

April 19th. The left chest was again tapped, and three pints and a half of a dark, reddish-brown fluid were withdrawn.

April 21st. Patient feels quite relieved, having now only a feeling of soreness in the left chest. He refused to have a permanent opening made, and was discharged "relieved."

CASE III. — G. B., aged 30, carpenter, entered hospital April 21st, 1873. Family history good. He has hitherto been well and strong; is temperate. Three weeks before entrance he had rigor and epistaxis, followed by fever, and severe pain in the right side, increased by deep inspirations. This lasted four days, and was immediately followed by a cough, which has continued, with expectoration of a sputum, "thin and whitish." Lately he has been troubled with difficulty of breathing, especially troublesome at night, with stitch-like pains in the right chest. Pulse, 120. Temperature, 102.8°. Respiration, 40.

When the patient lies on his back, the side of the right chest is very prominent; the intercostal spaces full, with diminished expansion. The right front is entirely dull; the

left front hyper-resonant. Entire absence of respiration in right front, except in clavicular region, where it is faintly bronchial. On the left front exaggerated respiration is heard. The heart's apex beats forcibly an inch and a quarter below and outside of the left nipple. The right back is completely dull, with entire absence of respiration; sound of voice nasal throughout. Right chest, on mammary line, measures nineteen inches; the left chest, eighteen and a half inches.

April 26th. The patient had a sleepless night, and complains a good deal of pains in the right side, which is now red and œdematous. Paracentesis was done, and two and a half quarts of sero-purulent fluid were withdrawn.

May 1st. Patient much easier. Sleeps well. Appetite good. Pulse, 100. Respiration, 24. Temperature, 98.8°. The œdema has entirely disappeared from the thorax. Dullness on right side anteriorly; begins at fourth rib, and from nipple downward is complete; comparative over upper half of back, and complete below. Distant respiration heard at angle of scapula and along its posterior edge; none below. Pleuritic friction at apex.

May 19th. Paracentesis was again done; half a pint of sero-purulent fluid was withdrawn, and the patient was discharged, "much relieved."

CASE IV. — M. McN., aged 38, rigger, entered hospital May 19th, 1873. Family history good. He has always been in good health. Since last November, however, he has had a cough and pain in the chest; has lost flesh and strength, but has not had hæmoptysis or night-sweats. Ten days before entrance he suffered with severe pain in the left side and back; also in the right back. Cough, now, has diminished, and the expectoration is scanty. He complains of pain in the right side, especially when he walks, or takes a long breath. Temperature, 101.7°. Pulse, 100. Respiration, 30.

The left back is dull in the lower half, and there is absence of respiration. There is a slight want of tone at the base of the right back, with creaking. Tincture of iodine to back. Quinine, tincture of gentian.

May 26th. Lower fourth of right back dull; lower third of left, dull; over the right back, at the lower half, are friction sounds; upper third, inspiration rude and jerking. Expiration prolonged, with sonorous râles. Respiration distant over upper half of the left back; friction sound at junction of middle and lower third. Heart-sounds labored, irregular and displaced.

June 10th. Left back, from angle of scapula down, perfectly dull. No respiration below the middle of scapula. The aspirator was used, and half a pint of serum withdrawn.

June 11th. During the night the patient was restless, had dyspnœa and nervous agitation. At the morning visit the respiration was 40; the pulse, 120. There is complaint of pain below the lower border of the ribs, on the left side. Respiration is heard clearly throughout the anterior part of the chest. The left back is clearer on percussion, and respiration is heard three inches below the angle of the scapula.

P. M. Has been in a rather stupid state all day. Temperature, 104.1°.

June 28th. Respiration at both bases, accompanied with subcrepitant râles. General condition much improved. He is discharged, "relieved."

CASE V. — J. R., aged 29, farmer, entered the hospital Nov. 7th, 1873. He had variola last winter, and has not felt so strong since; twelve days ago he had chills, and the following day dyspnœa; ten days ago he had to leave off work, and began to cough, the expectoration being slight, white and frothy. After the cough began he had pain in the side; the dyspnœa now became very great, and he was most comfortable in a sitting posture. When lying down he could rest best on the right side. Temperature, 102.1°. Pulse, 114. Respiration, 36.

Right chest flat throughout front and back; bronchial respiration and bronchophony over whole of right chest; no râles; intercostal spaces somewhat bulging; apex beat of heart in line with left nipple. Diuretics and tincture of iodine to the chest.

Nov. 10th and 11th. Resonance and vesicular respira-

tion at right apex, front and back. Subcrepitant râles occasionally heard over right front and upper part of back.

Nov. 15th. Dulness diminishes daily.

Dec. 13th. Right front dull below the lower border of the third rib; no change in lying down; right back dull nearly as high as spine of scapula; respiration feeble all over right back and almost imperceptible at base.

Jan. 9th. Murmur at apex of heart following first sound; abdomen is distended and area of splenic dulness increased.

Jan. 15th. Paracentesis performed, but owing to imperfection in aspirator only one ounce of very slightly bloody serum was withdrawn.

Jan. 30th. Right chest hyper-resonant, with loss of tone commencing one inch above nipple; amphoric respiration in upper two-thirds, with mucous râles at lower third, most marked on inspiration; respiration exaggerated over left front, with mucous râles at lower half of chest; want of tone over lower half of both backs, and absence of respiration in lower third of each back.

Feb. 8th. On full inspiration sibilant and sonorous râles, with distant pleuritic rubbing, were heard over the lower half of the left front. Mucous râles were heard in the lower part of the front of the right lung.

Feb. 12th. Thoracentesis again performed; five and a half ounces of serum, tinged with blood, were withdrawn.

Feb. 14th. At his request the patient was discharged, "relieved."

CASE VI. — J. K., aged 18, laborer, entered hospital Dec. 26th, 1873. He had never been sick before. Three weeks ago had a chill, followed by cough and stitch in the lower part of the right chest. No expectoration till two days before entrance; sputum whitish and frothy; considerable dyspnoea since cough began; patient has worked till six days ago, but has wasted rapidly. Temperature, 101.4° . Pulse, 104. Respiration, 36.

Right chest does not expand on inspiration; intercostal spaces obliterated, and this side measures one inch more than the left; left apex dull; expiration prolonged at both

apices, with harsh inspiration. Right back dull above spine of scapula, and flat below; respiration bronchial and very feeble below spine of scapula. Right front dull to level of nipple when sitting; line of dulness changes on lying down. Diuretics and tincture of iodine to chest.

Jan. 11th. Respiration heard to within an inch of right mamma; dulness back and front as before. Bronchial breathing heard through right back, more marked in lower half than before.

Jan. 16th. Thoracentesis performed and twenty-four ounces of pus withdrawn.

Jan. 20th. Much cough and sweating since operation; examination of right lung posteriorly showed same signs as on Jan. 11th.

Jan. 22d. Discharged at own request, relieved.

CASE VII. — P. K., aged 42, baker, entered hospital February 5th, 1874. Family history good. General health good. Had epithelial disease of lower lip removed last July. Is addicted to drink. Eleven weeks ago was seized with a severe chill, which was followed by fever, pains in epigastrium and night-sweats; some dyspnœa and palpitation on slight exertion; cough slight; was confined to bed for a day or two; lay on right side, and lost flesh and strength. Nine weeks ago noticed swelling of abdomen; four weeks ago œdema of feet appeared. Dyspnœa has increased the past month.

The patient was now much emaciated; countenance sallow and anæmic; slight cough; abdomen somewhat distended, but no fluid appreciable; slight œdema of feet.

Feb. 6th. Some fulness and immobility of left back and slight œdema of integument. Dulness over left back from lower third of scapula; on right side, from angle of scapula. Entire absence of respiration at each base; rubbing heard at posterior border of left scapula; dulness under left clavicle, and at lower part of each chest; friction and mucous râles heard above right nipple; rubbing sound also heard over middle of left front; liver dulness five inches in mammary line, five and one half in axillary; nothing felt on deep palpation.

Feb. 13th. Œdema much less ; right back has cleared up entirely ; dulness and distant respiration over lower portion of left.

March 7th. For some nights has been unable to sleep except on right side ; no œdema of legs. Hepatic dulness extends one inch below the border of ribs ; left chest prominent, intercostal spaces nearly obliterated ; less expansion of chest ; complete dulness over whole of front ; apex beat of heart felt to right of sternum ; complete dulness over left back and tubular breathing along posterior border of scapula. Paracentesis was performed, the puncture being made two inches below the angle of the scapula ; nearly seven pints of serum were withdrawn.

March 8th. Complete dulness below lower third of scapula ; subcrepitant râles along upper half of posterior border of scapula ; respiration distant to scapular angle, and absent below. Heart sounds more to the left ; some pitting over sternum.

March 20th. In front, resonance to half an inch above left nipple ; behind, to one and one half inches below spine of scapula. Respiration heard to one inch above angle of scapula and absent below. Respiration in front same as at last record.

Paracentesis again done ; four pints of serum withdrawn ; the back immediately became resonant to the angle of the scapula, and respiration was plainly heard to this point.

March 28th. Back still flat over the lower portion, with some want of tone above. Respiration heard throughout left back, with subcrepitant râles at base.

Discharged, relieved.

CASE VIII. — W. F., 20 years of age, waiter, entered hospital Feb. 25th, 1874. Family history good. Constitution and general health good. Was well up to a month ago. About that time he commenced to cough a little in the morning ; this continued, but his appetite and strength remained good ; four nights before entrance, the cough grew worse, and pain came on in the left side of the chest. Next day patient felt very sick and feverish, but without chill ; has never had hæmoptysis.

Present condition: in bed, feeling very weak; body well nourished; nails slightly clubbed; red line along gums; skin hot and dry; tongue thickly coated; thirst; coughs a good deal; sputa thick and yellow. Temperature, 103.5°. Pulse, 108. Respiration, 18.

Feb. 26th. Want of tone over left front. Respiration distant; on full inspiration, mucous râles are heard through left front, most marked below second rib, and occasional sibilant râles; right front, respiration exaggerated; want of tone in left back, dull at base; distant crepitant râles at middle of back, with absence of respiration at base; cardiac sounds normal.

March 1st. Examination of chest gives the same signs as before, except that respiration through the back is more bronchial.

March 6th. Left back dull and flat over lower half; entire absence of respiration below upper third of scapula; bronchial breathing at juncture of upper and middle thirds of scapula; less expansion of this side; sounds of heart heard most perceptibly at right of sternum; left chest dull except at apex.

March 10th. Paracentesis thoracis; four pints of serum withdrawn.

March 11th. Dulness much diminished over left back; still perceptible over lower quarter. Respiration heard down to an inch above angle of the scapula, with occasional subcrepitant râles.

March 25th. There is still want of tone over the left back and flatness at the base. Respiration heard to the angle of the scapula; absent below. Paracentesis; one pint of serum withdrawn. Back has become much more resonant and respiration is heard throughout.

March 30th. Discharged, well.

CASE IX.—J. C., aged 26, laborer, entered hospital March 10. Family history obscure. Constitution and general health good. Three weeks ago was taken with pain in left side, which was increased by full inspiration, and accompanied by a dry cough and chilly sensations. Pain and

cough have continued, although the pain has been less severe and more of a dull character. For the past two weeks has had dyspnœa; has lost flesh and strength; is now sitting up; cough, frequent; complains of pain in chest and weakness; tongue, natural; appetite, fair. Temperature, 100°. Respiration, 20. Pulse, 92.

March 11th. Left chest rounder; intercostal spaces full; very little expansion; apex beat of heart just to right of median line; dulness over upper fourth; flatness over rest of left back. Distant respiration heard above spine of scapula; none below. No respiration was heard below third rib in front. Paracentesis performed and five pints of serum withdrawn.

March 12th. Dulness commences one inch above spine of scapula, passes downwards, and becomes flat at base; still want of tone through left front, becoming flat on line with nipple. Respiration heard through left front to line of nipple, slightly tubular in character; apex of heart now beating one and a quarter inches to left of sternum. Tincture of iodine to chest. Quinæ sulphas, gr. ii., three times a day.

March 18th. Upper half of left back of almost normal resonance. Front of chest quite resonant. Respiration heard plainly to angle of scapula, and on full inspiration two inches below.

March 30th. Still slight want of tone of lower half of left back, but respiration is heard throughout.

April 3d. Discharged, well.

CASE X. — Michael J. O'C., an unmarried Irishman, aged 42, a bottle-maker, stated that he had not been well for six months; he had lost flesh and strength. He complained of cough, with pain in the chest, shoulders, and loins; no hæmoptysis. Physical examination revealed dulness in the left supra-scapular region, with broncho-vesicular respiration, and occasionally a moist râle. The respiration below this was somewhat bronchial in character. There was some dulness in the lower right back, with respiratory murmur very much modified and with bronchophony. Heart normal.

April 7th. Dulness under the right clavicle, and want of tone in the lower fourth. Respiration rude through the upper third, with an occasional moist râle in lower half. Respiration puerile in the left front.

April 15th. Area of hepatic dulness increased from the nipple to one inch below the ribs, with tenderness on pressure. Superficial veins of abdomen enlarged.

May 13th. The liver had resumed its usual limits, and the patient was out every day. There was still want of tone and absence of respiration in the lower fourth of the right back. The aspirator, with exploring trocar, was used, and four ounces of serum were withdrawn.

May 17th. Respiration was heard to the base of the right back. The patient was discharged, relieved.

CASE XI. — Mary C., aged 27, a domestic, entered the hospital April 1st, 1875. One sister had died of consumption. The patient was well till March 1, 1875. She had been sleeping in a cold, damp cellar all winter, and had worked very hard. She had been troubled with dyspnœa and cough at night, and with nausea in the morning; had lost flesh; had had night-sweats, but no hæmoptysis. There was dulness in the lower half of the left back, with modified respiratory murmur, and a few moist râles. The right back was normal. There was dulness in the left front, with modified respiratory murmur and dry râles. No bronchophony. The right chest had good resonance and exaggerated respiratory murmur.

April 28th. The heart was found pushed to the right side; apex beat in the epigastrium. Left front dull; respiration distant and bronchial below the third rib; left back as on the 10th. The left side was more prominent and had less expansion. Profuse night-sweats; not relieved by atropine. Tincture of iodine was applied to the back and side.

May 16th. No improvement. Absence of respiration below the angle of the scapula, and below the fourth rib in front. Patient complained of increasing dyspnœa. The needle of the aspirator was introduced one and a half inches

below the inferior angle of the scapula, and a pint and a half of clear serum withdrawn.

May 20th. Patient says she is much more comfortable and breathes easier. The left front is dull throughout. Respiration absent below the third rib (when patient is lying down). Left back the same as before the operation. Aspirator again used; the needle was inserted twice, but no fluid followed. Tincture of iodine was continued.

June 3d. Good resonance to inferior angle of the left scapula; below this, dulness and absence of respiration; no bronchophony. General condition improving.

June 23d. An exploratory puncture was made by Dr. Blake, and half a gill of clear serum withdrawn. Discharged June 30th, relieved.

The patient returned to the hospital for other trouble in September, and was under the care of Dr. Draper, who made the following note: "Modified resonance throughout the left back. Dulness at the base. Respiration heard two inches below the scapula."

CASE XII. — C. C., aged 40, a hypochondriac, with a history of pleurisy, intermittent fever, and hepatitis. The first of February had an attack of pleurisy, and was confined to bed four weeks. He entered the hospital May 6th, 1875.

Physical examination revealed the following condition: The right chest was one and a half inches larger than the left; the intercostal spaces were not prominent. Expansion was diminished. Dulness through the right back, becoming flat in lower fourth. On ordinary respiration the breathing was very distant over the upper two-thirds of the right back and absent below. With full respiration the breathing was exaggerated in the upper fourth, and tubular over the rest of the right back; somewhat masked by friction sounds. In the left back the respiration was puerile. The right front was relatively dull. The respiration was distant through the upper half of the right chest; absent in the lower half. There was some specific history. The abdominal veins were enlarged. Liver dulness in the mammary line, six inches;

spleen normal. An exploratory puncture was made, and half a pint of clear serum was removed.

May 18th. Respiration heard clearly to one and a half inches below inferior angle of scapula; distant below; lower half of right back still dull.

May 30th. Respiration heard throughout right back. Some want of tone in lower fourth. Discharged, well.

CASE XIII. — J. H. P., 40 years old, plasterer, entered hospital Feb. 28, 1876. His family history is good. He has overworked, and neglected his health. He has been a hard drinker for twenty years, at times drinking three pints of rum in a day, then abstaining for a year, and again returning to his old habit, keeping himself in a half-intoxicated state for months. He has for the three past months been temperate. He has been healthy till this winter. He first noticed nausea in the morning, which was relieved by stimulants. At the end of December he commenced to cough. This was especially troublesome on exertion, or when in the wind, and has steadily increased. Dyspnœa, which commenced a month ago, is now quite marked. There is no palpitation or pain; patient can lie on either side. Pulse, 116. Temperature, 101.6°. Respiration, 36.

The right back is less resonant than normal, with coarse mucous râles throughout. There is dulness over the lower half of the left back, with diminished respiration in the lower two-thirds, and dry creaking, most marked low down in the axillary line. Vocal fremitus is diminished in the left side, and the expansion of that side is lessened.

March 1st. Dry and moist râles are heard through both fronts, but especially in the right.

March 10th. There is less inspiratory movement of the left side; it is more prominent, with dulness through the lower two-thirds. In the area of dulness subcrepitant râles are occasionally heard; but these are probably transmitted from the right lung.

March 24th. The patient complains of greater difficulty in breathing, especially at night. The left pleura is aspirated, and nine and one-half ounces of bloody serum withdrawn.

March 29th. Patient more comfortable since the operation. Subcrepitant râles are heard through the lower two-thirds of right back, but less marked. Subcrepitant râles in the upper half of the left back, and a harsh friction rub over the lower half of the left back and sides. Dulness has diminished, and distant respiration is heard to base. Since the 24th the temperature has averaged 101° , rising at times to 102.8° , and again sinking to 99° .

April 19th. Breathing is now apparently normal throughout the upper half of the left front; inclines to bronchial in right front, with subcrepitant râles at the base.

May 4th. Under cod-liver oil, iron, and stimulants, the patient's general health has very much improved. Respiration in front remains the same as on the 19th. There is still dulness on the lower third of the left back, with distant respiration and crepitation in area of dulness.

CASE XIV. — Annie R., 18 years old, housemaid, entered the hospital March 11, 1876. Her family history is good. She has always enjoyed good health, and is a robust, well-nourished girl. Four weeks ago she began to complain of pain in her right side. This has continued, and during the past week has increased. She has been troubled with dyspnœa for five days.

There is flatness over the lower half of the right chest, with diminished respiration, and a crepitant râle on full inspiration through the lower third. In the left chest respiration is exaggerated. In the right back there is dulness from the spine of the scapula downwards; respiration distant; right side more rounded. Pulse, 110. Temperature, 101° . Respiration 26.

Tinct. of iodine to side; one grain of sulphate of quinine, thrice daily.

March 17th. A. M. Temperature, 98.6° . Pulse, 82. Respiration, 24. P. M. Temperature, 99.2° . Pulse, 90. Respiration, 24.

March 20th. Dulness as before; respiration is distant, but can be heard throughout the chest on full inspiration. Pleuritic rubbing in axillary line.

March 26th. The aspirator-needle was introduced two inches below the angle of the scapula, and six and a quarter ounces of thick, slightly bloody serum was withdrawn.

March 29th. Dulness still marked. Respiration distinct on full inspiration. Pleuritic rub over the lower half of the back. Patient doing comfortable, and walking about.

April 6th. Discharged, well.

CASE XV.—T. C., 65 years old, laborer, entered the hospital April 18th, 1876. He had always had good health until three months ago, when he began to have pain in the left side, downwards and outwards from the left nipple. This pain continued till his entrance to the hospital. For the past month he has been troubled with a cough, with frothy and slightly tenacious expectoration. No dyspnoea. He is very weak, and without appetite. Pulse, 92. Temperature, 101.5° . Respiration, 24. P. M.

April 19th. Face and neck are congested. Sleeps on left side, with head pretty low. There is no difference in percussion in either front; respiration is decidedly distant over the whole of the left chest, with bronchial breathing in the upper third. The upper half of the left back is dull on percussion; the lower half is flat; respiration is very faint over the upper half, and is absent in the lower. The heart-sounds are distant and slightly irregular. A. M. Pulse, 80. Temperature, 99.6° . Respiration, 24. P. M. Pulse, 92. Temperature, 101.5° . Respiration, 24.

April 20th. Had an uncomfortable night; complains of weakness. A. M. Temperature, 100.2° . Pulse, 80. P. M. Temperature 100.6° . Pulse, 80. The aspirator was used one and one-half inches below the angle of the scapula; twenty and one-half ounces of serum were removed.

April 21st. Complains of pain in left chest, and increasing weakness; he has a very painful cough, with frothy expectoration. One pint of ale, daily; two grains of sulphate of quinine, three times daily.

April 22d. No better; stimulants are given freely, and counter-irritation is applied to back. A. M. Temperature, 99.8° . Pulse, 104. Respiration, 28. P. M. Temperature,

102.7°. Pulse, 112. Respiration, 36. He continued to fail, and died on the 27th.

CASE XVI. — D. L., laborer, aged 38, entered the hospital April 27th, 1876. His family history is obscure. He has always been a healthy man, and is now strongly built, and in good condition. One week ago he had a "sharp chill," with pain at the angle of the left scapula. Since that time he has had a slight, teasing cough, with scanty expectoration, not bloody. After the chill the breathing became oppressed. He complains of weakness, of loss of appetite, and of restless nights. The skin is warm and moist, tongue covered with a brown coat. Pulse, 120. Temperature, 103.2°. Respiration, 28.

April 28th. Complete dulness over the left side; absence of respiration in this region, except above the second rib; apex beat to right of sternum, on line with the lower border of the ensiform cartilage; exaggerated breathing in right chest with sibilant râles at the base; dulness on the left back; respiration absent below the spine of the scapula. The skin about the upper part of the chest and in the neck is very much congested. The trocar of the aspirator was introduced two inches below the angle of the scapula, and forty-seven and a half ounces of pure serum were withdrawn, followed by a worrying spasmodic cough, which was readily relieved by morphine. After the aspiration respiration was heard down to the inferior angle of the scapula, and to within two and a half inches of nipple.

April 29th. Had a good night; percussion is clear, and respiration is heard to the third intercostal space on full inspiration. Posteriorly dulness extends from the spine of the scapula to the base of the lung; respiration is heard to the angle of the scapula. Tincture of iodine is applied to the side.

May 1st. A. M. Temperature, 102.2°. Pulse, 112. P. M. Temperature, 103.5°. Pulse, 120. Respiration, 28.

May 2d. Increased dyspnœa. Respiration, distant in character, can be heard above a line one inch above the angle of the scapula; it is absent below. Thoracentesis was done,

and four pints of serum were removed. After the operation the respiration became slightly more distinct as far as the angle of the scapula.

May 3d. A. M. Temperature, 101° . Pulse, 108. P. M. Temperature, 101.7° . Pulse, 116. Respiration can now be heard to an inch below the angle of the scapula; it is distant as far as the third rib in front. The heart-sounds are heard below the sternum.

May 7th. Dyspnœa again pronounced. The pleural cavity was aspirated, and three pints of serum removed.

Dr. Doe now took charge of the service. He kindly gives me the following subsequent history of the case.

May 10th. Tincture of iodine applied to the chest and back. No liquid of any kind. Meat and bread diet.

May 11th. Respiration more distinctly heard than at any time during the past four days. Sibilant râles at the angle of the scapula. Tincture of iodine to side repeated. Half a glass of water for drink within the next twenty-four hours. Half an ounce of citrate of magnesia daily.

May 12th. Sibilant râles and faint return of respiration to one inch below yesterday's level. One-half a pint of milk thrice daily.

May 14th. Pulse, 96. Respiration, 28; more abdominal than thoracic. Thorax tapped, and thirty-five ounces of serum withdrawn. One-eighth of a grain of elaterium thrice daily.

May 19th. Broncho-vesicular respiration one and a half inches below the spine of the scapula. Contraction of chest walls noticed just across the spine of the scapula.

May 27th. Respiration heard to the base, bronchial in character.

June 2d. Service of Dr. Arnold. Back flat from one inch below the spine of the scapula to the base. Vocal resonance to this point only; respiration absent below; bronchial respiration immediately above.

June 11th. Respiration and vocal resonance heard as low as the angle of the scapula, three inches lower than at last examination.

July 9th. Flatness throughout the left back. Respiration, of a tubular character, heard close to the base.

July 21st. Physical signs show slight increase of effusion. General condition much improved.

Aug. 11th. Respiration, bronchial in character, heard close to base.

Aug. 22d. Discharged, nearly well.

CASE XVII. — James C., born in Ireland, 38 years of age, married, entered the hospital January 24th, 1877. His family history is good. He has always been well till four months ago, when he took cold. This was followed by a cough, with muco-purulent expectoration, which now is scanty. He has had several attacks of hæmoptysis, though none lately. He complains of dyspnœa, anorexia, profuse night-sweats, and loss of flesh and strength.

Jan. 25th. Physical examination finds the right front dull from the clavicle to the liver. The left front shows a want of tone, more marked just under the clavicle. In the right front is bronchial breathing and bronchophony above the third rib; below, there is complete absence of respiration. In the left front respiration is rather harsh just below the clavicle. In the right back the upper third is dull; the lower two-thirds flat. Resonance is fair in the left back. In the upper third of the right back the breathing is bronchial; the lower two-thirds show entire absence of respiration. In the upper third of the left back the breathing is somewhat bronchial; at the base are subcrepitant râles. The apex beat of the heart is most marked one inch outside and below the left nipple. The right side of the chest measures nineteen and one-eighth inches; the left, eighteen and three-eighths inches. There is also diminished expansion and vocal vibration. The aspirating needle was introduced three and a quarter inches below the inferior angle of the scapula, and three pints of clear yellow serum were withdrawn. Aspiration was now discontinued, as the patient became faint. There was no cough, nor did he complain of pain.

Jan. 26th. Patient sitting up; says he is much relieved. Temperature, 99.5°. Pulse, 88.

Jan. 27th. Patient is walking about the ward. Right front, when patient is sitting, is resonant to the third rib;

when he is recumbent, to the fourth ; there is a want of tone below. In the right back the resonance is as before. Respiration is indistinctly heard to one inch below the spine of the scapula ; absent below that region. On full inspiration respiration is heard to within one inch of the inferior angle of the scapula.

℞. Pulv. digitalis, gr. i.
Pulv. colchici sem.,
Sodæ bicarb., āā gr. ii. M.
Fiat pulvis, bis die sumendum.

Jan. 30th. The patient had a sleepless night. Respiration is indistinctly heard to the fourth rib, with mucous râles ; these are most marked under the clavicle. The apex beat is under the nipple. Respiration is heard on full inspiration two inches below the inferior angle of the scapula.

Feb. 1st. Right front dull below the fourth rib. Respiration heard to nipple, with mucous râles. Tincture of iodine to side.

Feb. 3d. Dulness much less marked. With ordinary breathing respiration is heard two inches below the inferior angle of the scapula, though somewhat harsh. On full inspiration respiration is heard three inches below that point.

Feb. 9th. There is still some want of tone in the right back. On full inspiration respiration is heard to the base, coarse in character. Temperature, 98.4°.

Feb. 13th. Discharged, well.



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CASE I. BONES REMOVED BY EXCISION.

220 Dev. St., Boston.

ON EXCISION OF THE ELBOW-JOINT.

BY DAVID W. CHEEVER, M. D.

I. SUB-PERIOSTEAL EXCISION.

H. C. T., a lad of 14 years, at the age of eleven met with an accident by which the left elbow was severely contused, but not broken. Inheriting a specific tendency, his constitutional powers were not sufficient to repair the injury, and for three years he suffered from acute arthritis. At the time of entering the hospital the left elbow was largely swollen, cedematous, red, tender, and spindle-shaped. Motion was restrained by pain. There was no open abscess.

The parts were laid open by a single straight incision through the aponeurosis of the triceps, parallel to the axis of the arm. Pus, infiltration, and carious bone were found; but the disease was limited to the joint. Excision of all the articular surfaces was now performed, mainly by the scraper, the knife being used very little. The operation lasted one hour. At its close, the bones having been sawed, there was left a roughened sac of periosteum, studded here and there with bony plates, which were left untouched. There were no vessels requiring ligature. The arm was placed on a slightly bent splint, and the wound left open, and dressed with liquor sodæ chlorinatæ.*

The patient remained three and a half months in the hospital, doing well. The wounds being closed, he was then discharged, with the arm in a sling. He was instructed to use moderate passive motion.

Uninterrupted recovery took place, and the arm became a very useful one. He could flex the fore-arm to an acute angle with the arm; extend perfectly; rotate and supinate

* City Hospital Records, Vol. XXV., p. 174.

about one-half the normal amount. He could carry a pail of water, or a hod of coal, with the arm extended down by the side; he could dress himself, and use his knife and fork; he was employed several years in a large retail house doing up bundles. At arm's length he could hold out an average-sized octavo book. The photograph of him, in this position, was taken about two years after the operation. For four years longer he improved in the use and strength of the arm. A great spreading of the lower end of the humerus took place; and strong buttresses of new bone were developed for the attachment of the flexor and extensor muscles.

Six years after the operation, having constantly suffered from specific keratitis and ozæna, with deafness, his health failed; his urine became albuminous; dropsy supervened, and he died at the age of 21 years. The elbow was entirely unaffected by his other maladies; and the arm remained useful until his death.

In his last hours he called his mother to him, and told her that he wished his excised arm to be removed from his body after his death and given to me. This wish was agreed to by his relatives; and the day after he expired the new elbow-joint was cut out entire by his attending physician, Dr. E. W. Cushing, and forwarded to me.

The results of the operation, and the structure of the new joint, will now be described and illustrated.

Dissection of the newly-formed elbow-joint seven years after excision.—The arm was of fair size and moderate strength. The brachial artery was quite small. The ulnar and median nerves were large; the musculo-spiral nerve was of average size.

The flexor group of muscles was strongly attached by fascia (aponeurosis) to the humerus, and to a slightly movable internal condyle. The extensor group of muscles was firmly attached to the long, hooked process of the new external condyle. The attachment of the tendon of the biceps muscle to the tubercle of the radius was perfect. The



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CASE I. AFTER EXCISION.

brachialis anticus muscle was attached (origin) far down on the humerus, and inserted over the new coronoid process of the ulna by a rounded tendon, very strong. The broad tendon of insertion of the triceps muscle was very much thickened, and attached by an aponeurosis to the new olecranon process, and largely to the fascia of the fore-arm. In this tendon was developed a bony plate, probably a new centre of ossification, but resembling a sesamoid bone.

There was a new and very perfect orbicular ligament for the head of the radius; in this the bone rotated about one-half its normal arc. There was no proper synovial membrane; the articular surfaces of the bones played freely and easily in a soft, smooth cushion of connective tissue and finely divided fat.

The movement of flexion was through two-thirds of its normal arc, being stopped at an acute angle by the head of the radius striking the humerus. Extension was perfect. Rotation was about one-half the normal amount.

In position the bones of the fore-arm were displaced towards the ulnar side. The head of the radius was pushed towards the ulnar side by the great development of the external condyle of the humerus. The ulna opposed a piece of bone representing the trochlea and the internal condyle, but farther to the ulnar side than normal. The new olecranon locked around the inner condyle; and there was no true olecranon fossa.

The peculiarities of the bones were as follows:—

Humerus.—On the back of the shaft could be seen a transverse bony ridge and depression, marking the point where the bone was sawed seven years before. From this line to the tip of the cornu of the new external condyle measured two inches. From this line to the end of the new internal condyle and trochlea, three-fourths of an inch. The breadth of the articulating end of the humerus across, from outer to inner condyle, was two inches. Since the excision, then, the humerus, at its lower end, had grown new bone two inches in lateral expansion, and from three-fourths of an inch to two inches in length. The new *external* condyle was a

long, bony hook, curved inwards, perfectly united by bone to the shaft, and very strong. The new *internal* condyle was an irregular bony epiphysis, square and large on the ulnar surface, and embracing the end of the shaft by three long, bony fangs, like those of a molar tooth. There was no proper trochlea, nor lesser head; no coronoid fossa, and no olecranon fossa. In place of these was an irregular fossa, in which the head of the radius lay. This cavity was not all bone, but was cribriform; strengthened by bony ribs and spicula, and evidently in process of growth.

The *radius* had a new and perfect head and neck, hardly distinguishable from an unmutilated bone. It articulated with the humerus and with the ulna. The new head of the radius rested above and in front of the new outer condyle. The *ulna* had a well-marked new coronoid process; a deep and rounded greater sigmoid notch, and a well-marked lesser sigmoid cavity for the radius. The olecranon was a separate process, one inch and five-eighths in length, shaped like a clavicle, and attached by cartilage to the ulnar side of the head of the ulna, and not to the posterior surface. It thus hooked around the inner condyle of the humerus.

The ulnar nerve, in its sheath, was snugly included between the new inner condyle and the new olecranon.

Returning now to the condition of the bones as they were left after the excision, we had all the articular surfaces removed, and only the sawed ends of the shafts of the radius, ulna and humerus left opposite to each other.

From these shafts had grown —

- (1.) A new head of the radius.
- (2.) A new coronoid process firmly attached, and a new (rudimentary) olecranon, partially attached, to the ulna.
- (3.) A long, powerful hook of bone representing the external condyle of the humerus, and firmly attached to the shaft.
- (4.) A large, partially detached and irregular bone, representing the internal condyle and trochlea.
- (5.) The articular end of the humerus, trochlea and



CASE I. NEW JOINT, radial side.
Seven years after excision.



CASE I. NEW JOINT, ulnar side.
Seven years after excision.

lesser head, imperfectly repaired, but in process of bony growth.

If we consult the normal growth of the elbow-joint,* we shall find that all these secondary growths, after the excision, correspond to the epiphyses in the unmutilated bone, except the growth of the coronoid process. In natural development the coronoid grows with the shaft, and has no separate epiphyseal centre of ossification. After this excision the coronoid grew out from the sawed shaft of the ulna, and showed no signs of a separate centre of ossification. In normal development the lower end of the humerus has four ossific centres: one for the lesser head, one for the internal condyle, one for the great sweep of the trochlea, and one for the external condyle. The two latter do not appear until from the twelfth to the fourteenth year of age, and the lower end is not completely ossified until the close of the sixteenth year. The radius has a centre for the shaft, and one for each end. The head ossifies at nine, and unites at twelve years. The ulna has three centres: one for the shaft and coronoid process, one for the lower end, and one for the olecranon. The olecranon ossifies at eight years, and unites by bone indissolubly with the shaft at the age of twenty.

The excision, having been done at 14 years of age, found the lower end of the humerus solidified and thickened by inflammatory changes; the button-head of the radius, an epiphysis partially united; the tip of the olecranon, also an imperfect epiphyseal junction. It will be noticed, however, that all the bone-sections in the operation were sawed in the shafts, above the lines of the epiphyses. It is an interesting problem to consider how much the typical and very complete reproduction of epiphyseal centres in the new elbow-joint depended on the immature age (14 years) at which the operation of excision was done, and how much on the very careful and slow method of operating sub-periosteally by the bone-scraper, and not with the knife, thus saving a greater part of the bone-growing membrane.

* *Vide* Holden's Human Osteology.

II. PRIMARY EXCISION FOR INJURY, BY THE NON-PERIOSTEAL METHOD.

Patrick K., a healthy young man, at the age of 19 years, had a lacerated and comminuted compound fracture of the elbow-joint, produced by the falling of a roofer's tar-kettle from a wagon, the iron leg of the kettle penetrating the joint. There was but little injury of the soft parts. The elbow-joint was badly broken up, and was immediately laid open and formally excised. All the bones were sawed just above the articulating surfaces. No attempt to save the whole periosteum was made, on account of the crushed condition of the bones.* He remained five months in the hospital, and left well, with the wounds closed. He has had no trouble in the elbow since. The arm is very useful, but not so perfectly restored, either in bony processes or function, as in the case first described. He can carry heavy weights, and hold out a considerable one at arm's length. The new joint is flail-like, and the bones of the forearm slip by the end of the humerus when in action. The power of the arm is in the muscles, like an infant's arm; the bony strength is less than in the first case. The photographs were taken three years after the excision.

* City Hospital Records, Vol. XLV., page 24.



Heliotype.

CASE II. THE ARM AT REST.
Three years after excision.



CASE II. THE ARM IN ACTION.
Three years after excision.

CLINICAL NOTES ON ERYTHEMA.

BY HOWARD F. DAMON, M. D.

ERYTHEMA is a disease which, for its importance, has received but comparatively little attention from medical writers, with a few honorable exceptions, since the days of Willan.* Many dermatologists have been contented, indeed, in following this admirable observer, to the extent that scarcely anything original has been contributed to our knowledge, as regards the description, clinical history, geographical distribution, or causes of erythema; still less has been accomplished for the rational treatment of this protean disease. Previous to the writings of Willan there was not much system in the classification of the erythemata. Some of the ancient Greek writers on medicine had, however, recognized the local and constitutional varieties into which the erythemata are naturally divided. Willan, although familiar with their views on this subject, has described the different varieties of erythema, as they presented themselves to his observation, without giving any special significance to their idiopathic and symptomatic origin.

According to Hippocrates the erythemata from local causes were denominated paratrimmata and apotrimmata. The most common varieties of this kind of erythematous affection were the redness of the skin produced by narrow shoes and sandals, and that caused by riding on horseback.

The constitutional varieties of erythema, mentioned by this writer, consisted of patches of redness, which not unfrequently make their appearance on the cheeks, nostrils and neck, in fevers, enteric diseases, hemorrhages and sore

* Cutaneous Diseases. London, 1808.

throat; also, the redness of the hands and feet observed in some acute diseases, on the approach of death; and the broad patches of redness on the chest, having the same import in pneumonia.

The name erythema was especially applied to the above varieties of redness, or hyperæmia of the skin. Those varieties of redness, which, in the course of various diseases, were considered prodromata of death, were also denominated erythemata lata.

The paratrimma and apotrimma of the Greeks are represented by the intertrigo of modern writers; but no special names are given to the symptomatic varieties of erythema, the erythemata lata, or hypoplatea of the Greek writers.

It may seem strange to us that the ancient Greek writers on medicine should have passed over in silence that large group of erythematous diseases which are characterized by such important clinical and pathological features as those which we are about to describe. Indeed, it is probable that many of the varieties of erythema now known to observers in different parts of the world did not exist in the regions, and under the climatic conditions by which the Greek writers were surrounded, and which constituted for them a peculiar medical atmosphere. Statistics of dermatologists of other countries, as well as in different sections of our own, show considerable variations in the frequency of erythema, in relation to other cutaneous diseases. These differences appear to correspond to certain thermal and hygrometric conditions, to which we have elsewhere called the attention of observers.*

In our descriptions of the different varieties of erythema we shall confine our attention to those forms of the disease which originate from constitutional causes, whether inherent in the individual, or produced by his mode of life and surroundings. Previous to the examination of our own cases we shall give a brief historical survey of the principal writers

* Some General Remarks on the Relative Frequency of Skin Diseases. By Howard F. Damon, M. D. Journal of Cutaneous Medicine. London, 1870. Pp. 103 to 105.

on the subject, in order to determine more precisely the grounds on which the existing varieties of erythema are established. We shall thus ascertain more nearly the national or local differences which exist in this disease, and the probable causes to which they may be attributed.

CLASSIFICATIONS OF ERYTHEMA.

The following varieties of erythema have been described by Willan: erythema fugax, læve, marginatum, papulatum, tuberculatum, and nodosum. A brief description of each of these varieties will be given hereafter, when they are considered more in detail.

Willan's classification of these diseases was generally adopted by medical writers during the next quarter of a century. Afterwards come the systems of Rayer* and Alibert,† the latter of whom has given us the additional varieties, known as erythema epidemicum and erythema endemicum, while the former has introduced the terms idiopathic and symptomatic erythema.

Cazenave and Schedel‡ do not differ in their classification of erythema essentially from Willan. Besides a description of acrodynia, they give an account of a remarkable variety of erythema observed by Biett, and described by that writer under the name of erythema centrifugum.

Bazin admits two kinds of erythema;§ one from external, and the other from internal causes. According to this writer the arthritic diathesis and scrofula are the only constitutional diseases which give birth to erythema.

Good|| describes the constitutional forms of erythema under the following heads or species: Erythema œdematosum, erythema erysipelatosum, erythema gangrænosum, and erythema vesiculare. The first species corresponds with the erythema læve of Willan; the second is erysipelatos in-

* *Maladies de la peau.* Paris, 1826. Tome I., p. 96.

† *Maladies de la peau.* Paris, 1833. Pp. 7 and 8.

‡ *Maladies de la peau.* Paris, 1847. P. 66.

§ *Affections de la peau.* Paris, 1862. Pp. 63 and 64.

|| *The Study of Medicine.* Boston, 1823. Vol. II., pp. 200 to 210.

flammation; the third, gangrenous; while the remaining species is probably erysipelas migrans.

Willis* describes a disease which he considers erythema papulatum et tuberculatum, of which he gives an illustration. Both the description and illustration show the disease to differ somewhat from the cases which have come under our own observation.

Elliotson† has given a more extended account of the particular variety known as erythema tuberculatum than any other English writer. He coincides with Willan as regards the appearance and general symptoms of the disease, and its dangerous if not fatal character. In respect to the other varieties of erythema, he also accords with Willan in his descriptions.

Wilson‡ describes, in addition to the already established varieties of erythema, an erythema circinatum, an erythema annulare, and an erythema iris. He has given excellent descriptions and illustrations of these rare, yet distinct varieties of erythema.

Hebra§ divides the constitutional varieties of erythema into the hyperæmic and exudative forms. He considers the following varieties of erythema, under the title of erythema exudativum multiforme, as merely forms of the same disease in different stages: erythema, papulatum, erythema tuberculatum, erythema annulare, erythema iris, and erythema gyratum. More than two of the forms, however, rarely coexist.

For practical purposes, therefore, it is better to consider the different varieties of constitutional erythema separately, as they usually occur in nature. These varieties, described as having distinct characters or phenomena, are as follows:—

WILLAN. *Erythema fugax*, *E. marginatum*, *E. læve vel œdematosum*, *E. papulatum*, *E. tuberculatum*, *E. nodosum*.

* Illustrations of Cutaneous Diseases. Folio. London, 1841.

† Principles and Practice of Medicine. London.

‡ Portraits of Diseases of the Skin. Folio. London, 1847.

§ Hautkrankheiten. Erlangen, 1860.

GOOD. *Erythema erysipelatosum*, *E. vesiculare*, *E. gangrænosum*.

BIETT. *Erythema centrifugum*.

WILSON. *Erythema circinatum*, *E. annulare*, *E. iris*.

HEBRA. *Erythema exudativum multiforme*.

Alibert describes acrodynia and pellagra under the respective titles of erythema epidemicum and erythema endemicum.

I. *Erythema fugax*. — Erythema fugax consists, according to Willan, of red patches irregular in outline, of short duration, and successive in their appearance. They occupy the face, neck, breast, arms, etc. They occur in some cases of bilious diarrhœa, and in continued fevers; and are also occasional symptoms in hysteria, dyspepsia, and hemicrania. Patches of erythema fugax may make their appearance on the fore-arms, lower extremities, neck, and occasionally on the body; in the course of typhus and puerperal fevers. In these diseases they are generally indicative of a fatal termination. Willan cites an instance of this kind in a case of puerperal fever, or peritonitis.

The author has noticed a general erythematous condition of the arms and lower extremities in a fatal case of peritonitis, following the rupture of a pelvic abscess, and the discharge of its contents into the peritoneal cavity.

This variety of erythema is described by Hebra in his class of hyperæmiæ cutaneæ as erythema congestivum. In this class he includes the roseola rashes, which are more general and typical in their distribution and course than the disease now being considered. Erythema traumaticum, erythema caloricum, and erythema ab acribus seu venenatum are also placed in the same class. He admits of the great variability in the duration of these diseases, and of symptoms indicative of exudation, and of hemorrhage into the skin.

The roseola rashes are a peculiar group of symptomatic affections, and should by no means occupy a place side by side with those idiopathic forms of hyperæmiæ produced by the action of mechanical, chemical, or other purely local agents upon the skin.

Erythema fugax is synonymous in its application with erythema simplex and erythema diffusum. It may properly be called erythema acutum, in contradistinction to erythema chronicum. The latter term is especially applicable to those forms of erythema which are of long duration, and attended with exudation into the skin or subcutaneous cellular tissue.

CASE I. — Dec. 7th, 1873. Mrs. F., aged 23, had been sick about four days with loss of appetite, sudden attacks of colic, tender and distended abdomen, constipation, and retention of urine. Her pulse was 116, and her tongue, which was red at the tip, was covered at its base with a thin white coat. Most of the pain and tenderness was in the lower part of the abdomen.

Dec. 8th. Hands and forearms were of a deep rosy red, or scarlet color. There was less erythema of the lower extremities.

Dec. 9th. Temperature of hands was 96.5° F., and of axillæ 98.5° F.

Dec. 10th. Pulse, 120. Pain and flatulence had ceased, and the patient was evidently moribund. She died early on the following morning.

An autopsy showed a large quantity of serous and purulent effusion into the abdominal cavity, hæmatocele in connection with the right ovary, rupture of abscess into right side of pelvic cavity, and pelvic peritonitis. Erythema, in this case, was evidently a symptom of reflex vaso-motor disturbance.

Opiates, beef-tea, and stimulants were used in treatment.

We have noticed a few cases of erythema of the ears in hysteria, and the mild forms of mania. Erythema, in these cases, is generally chronic.

Profound affections of the nervous system, hemicrania and

neuralgia, give rise to erythema simplex, which becomes chronic.

CASE II. — June 15th, 1868. Peter R., aged 45, married, varnisher, has had erythema of his left ear, more or less constantly for the last five months. His nervous system seems profoundly affected, causing tremor. He has suffered from nocturnal emissions every second or third night during the last five months. These symptoms may be partially or wholly due to his occupation as varnisher.

CASE III. — June 29th, 1875. Mary B., aged 50, was attacked with neuralgia of the left arm four days ago. Pain was very severe on the following day, when the back and ulnar border of the arms became erythematous and somewhat swollen. Pain has nearly ceased, but redness and œdema remain.

The following cases of erythema fugax depend probably upon the peculiar sensitiveness of the individuals to the thermic and dynamic conditions of the atmosphere.

CASE IV. — Oct. 27th, 1869. Daniel C., aged 26, blacksmith, is subject to erythema of his hands in the morning, and sometimes to œdema also. His face is similarly affected when out in the wind. Occasionally his eyelids swell, so that he can hardly see. The swelling and erythema often subside in the course of an hour. The first attack of this kind was five years ago.

CASE V. — Aug. 15th, 1870. Kate C., aged 21, has had frequent attacks of erythema of the face, during the last three years, especially when out in the evening, or exposed to east winds. Her face becomes red, swollen, hot and painful. These symptoms disappear in about three days.

CASE VI. — Sept. 7th, 1874. Andrew M., aged 33, has erythema on the right side of the upper lip, with some swelling since yesterday. He has been subject to similar attacks

at this season for the last three years. There is pain in the part previous to the appearance of the erythema.

CASE VII. — May 10th, 1875. Alice R., aged 19, has erythema and some swelling of her right cheek. The erythema began, night before last, below the inner canthus of the eye. The cheek is now red, somewhat swollen, feels hot to the touch, and to the sensation of the patient. She has acne disseminata of the forehead.

CASE VIII. — Sept. 17th, 1870. Thomas M., aged 7, has erythema of both cheeks for the past two days. His face was quite hot yesterday. There is no perceptible swelling, and the disease is about to decline.

CASE IX. — Sept. 12th, 1870. Mary D., aged 11, has recurrent erythema beneath the left eye, with some œdema. The erythema returns nearly every week. It usually lasts three days, and is attended with pruritus. In some respects this variety of erythema resembles urticaria tuberosa, or an aborted zoster infraorbitalis.

II. *Erythema marginatum*. — Erythema marginatum consists, according to Willan, of patches bounded on one side by a hard, elevated, red border, which becomes tortuous and papulated. This variety occurs on the legs, thighs, loins, and outsides of the arms, in advanced age, and lasts from three to six weeks. There is absence of pain and pruritus, and its appearance is considered unfavorable. These patches become livid several days before they disappear. Their margins subside slowly, and the erythema terminates without desquamation. Willan mentions a case of this disease, in a woman aged sixty, who was affected with pulmonary symptoms, which were temporarily relieved by the appearance of patches of erythema marginatum on her arms and thighs. When they disappeared the pulmonary symptoms returned with greater severity, and the patient soon after died.

The following case of erythema marginatum was probably due to some innervation of the part:—

CASE I. — Dec. 2d, 1871. Mary B., aged 19, tailoress, has erythema marginatum of the radial border of the left hand, of three weeks' duration. The margin of the erythema is elevated, and of a dull purplish red color, which disappears on pressure, but returns immediately afterwards. She has a red, furfuraceous condition of the face, of one week's duration.

Similar in its appearance to the above case is the one about to be given, and which was attributed by the patient to a slight scratch on the right palm, near the base of the little finger, with a beef-bone, previous to its being cooked.

CASE II. — Oct. 14th, 1874. Mrs. Mary G., aged 31, injured right palm slightly, over three weeks ago. Redness began, five days afterward, near the scratch, and has now spread over the back of her hand, with a distinct, elevated, rosy margin, on the dorsum of the hand, from ulnar border of wrist to knuckle of index finger, second joint of middle finger, terminal phalanx of ring finger, and entire little finger, which is quite sensitive. As the erythema advances, the skin, previously affected, becomes of a bluish or leaden-colored redness. There is a burning sensation in the hand, and the heat of the diseased portion is slightly increased.

III. *Erythema œdematosum*. — The erythema læve of Willan is represented by the erythema œdematosum of modern writers, and consists, according to him, of distinct red patches, of the size of a shilling, which become confluent, or nearly so, in a few days. It is situated chiefly on the lower extremities, which become œdematous; it occurs in young persons overtaken, in advanced age after fatigue, after excess in spirituous liquors, in dropsy, in diarrhœa, and at the catamenia. Its duration is uncertain, in some cases several weeks; there is pain, often slight fever, and the disease becomes darker in color before it fades. After the œdema subsides there is often extensive desquamation. According to Hebra, erythema læve is not a peculiar skin disease, but "only a simple erythema on a serous-infiltrated, œdematous, dropsical skin."

It is not unusual to have considerable œdema in acute erythema of the face, and in chronic erythema of the lower extremities, more especially when the latter occurs in debilitated persons. In erythema of the face, the œdema, when it occurs, is of but few days' duration; whereas, in the lower extremities, it may persist for weeks, and even months. Œdema of the lower extremities is quite as frequent in chronic eczema of these parts as it is in erythema; we cannot, therefore, consider it a symptom which belongs exclusively to either disease. Frequently the erythema precedes the œdema, and in such cases cannot be properly attributed to the latter. It is not improbable that similar constitutional causes may occasionally give rise to both conditions.

Erythema œdematosum is confined almost exclusively to the lower extremities, and may attack either one or both of them. According to our observations, in only one-fourth of the cases are both of the lower extremities attacked, while the other three-fourths are about equally divided between them.

The disease occurs twice as often in men as in women, but seldom appears in young persons. In most of our cases the patients were not attacked until the fortieth year.

From the fortieth to the sixtieth year is the usual time for erythema œdematosum to occur. Occasionally this symptom is associated with erythema tuberculatum.

The following cases will serve to illustrate the clinical history of this affection more completely than any general description:—

CASE I. — Oct. 1st, 1869. Nathan C., aged 42, a carpenter by occupation, stands continually at the bench, while at work, and has done so during the past four years. He has had erythema œdematosum of his right leg for the last eighteen months. The œdema also extends to the dorsum of the foot. There is a deep erythematous blush over the lower two-thirds of the leg, while its anterior portion is of a deeper red color, owing to its being more firmly congested. The sides of the leg are somewhat tawny, in consequence of pigment deposit, as the result of congestion, and probably

of slight capillary hemorrhages into the skin. The skin is not shiny or glossy, as in those cases of erythema consequent upon anasarca, but presents a thickened or hypertrophied appearance, caused by the turgidity of its capillary arteries. The œdema affects its areolar rather than its vascular layer, as it can only be indented upon deep and somewhat prolonged pressure. The leg feels hotter than natural to the touch, and there is a sense of unusual heat felt by the patient. Sometimes there is considerable pain in the affected leg, and last night the pain extended upwards on the inner side of the thigh as far as the groin. Then the patient had an uncomfortable feeling about his heart for a few minutes, followed by slight sickness at the stomach.

The erythema came on after exposure in the winter, and an attack of bronchitis and pneumonia, which caused the patient to keep his bed during the months of February, March, and the early part of April.

A flannel bandage was ordered for the leg, and five minims of liquor arsenicalis were prescribed to be taken after each meal.

Oct. 9th. The patient wore the bandage a few days, but did not like it. The œdema is rapidly disappearing under the use of the remedy. On the left leg, just below the calf, is an ulcer about an inch in diameter, with a bluish border, and a centre which is insensible to the touch. In the month of May last it commenced as a little red spot, with pus or fluid in the centre. Patient has a somewhat disagreeable or stinging sensation in the border of the ulcer.

CASE II. — June 1st, 1869. Daniel C., aged 26 years, plasterer, has been standing a great deal during the past two weeks; he has also kept very late hours, and drank freely of liquors. One month ago this patient had erythema of the inside of the left forearm, which lasted two weeks. He has, at present, erythema of both legs, of a week's duration, and œdema during the last three days. There is no itching. The erythema and œdema are very marked in appearance. This patient was admitted to the medical ward.

IV. *Erythema papulatum*. — According to the description given by Willan of erythema papulatum "the surface, as far as the redness extends, is, at first, rough or papulated. The eruption is diffuse, and without any regular boundary. On the second or third day, when the color becomes vivid, the papulæ disappear, but the skin continues red and furrowed for ten days or a fortnight. As the efflorescence declines it assumes a bluish or livid hue, and soon after terminates by desquamation." This disease, according to the same observer, attacks the breast, neck, and forearms, after exposure to sudden alternations of heat and cold, especially of the arms, and the abuse of spirituous liquors.

Exudation takes place frequently, and to more or less extent into the papules. Willan mentions a case in which there was effusion of lymph of a yellowish color, but no vesication. We have observed vesicles on some of the papules into the serous contents of which hemorrhage had taken place. Hebra mentions a case of erythema papulatum, in a patient who died of pneumonia, "where each one of the papules was plainly visible on the dead body, and when cut through, it became evident that they were caused by hemorrhagic exudation." In the case mentioned by Willan, "the cuticle separated gradually without any discharge of fluid."

No accurate idea of the extent of the papules in erythema papulatum can be obtained either from Willan's description or the illustration which he has given of this disease. Subsequent writers either make no mention of this point, or they are at variance with each other in their descriptions. Indeed, it is not always possible to measure the exact extent of the redness in a papule of erythema; nevertheless, an approximate measurement can be made. Hebra describes the papules as "between lentils and beans in size;" and they are represented in his plate of the disease as having a diameter of one-eighth to one-fourth of an inch.*

* Edition of New Sydenham Society, Vol. I., p. 286; Atlas der Hautkrankheiten. Folio. Wien, 1866.

Neumann describes erythema papulatum as appearing "in the form of papules of the size of a pin's head, elevated above the skin and surrounded by a red areola. The peripheral redness disappears in a few days, and only the central papule remains as a small crust or thin scale." *

The papules in erythema papulatum, according to our own observations and actual measurements, are from one-eighth to one-fourth of an inch in diameter. When larger, they are usually livid, especially in the centre, or of a dull, leaden color; or, they become confluent, and slowly decline. The margin of the papule is sometimes persistent, elevated, and rosy, after the central redness has disappeared, together with the bluish or leaden appearance. This condition constitutes the erythema circinatum of Wilson, when it exists to any considerable extent.

The color of the papules is rosy red when they first appear; but they become pale in the centre in the course of two or three days, and even much sooner. This phenomenon is due to the presence of exudation which temporarily expels the blood from this portion of the papule. When the exudation is absorbed the blood returns again to the centre of the papule, which then presents a redness nearly uniform with that of the margin. If the blood is forced in a mechanical manner from the skin by stretching the part, the papules will appear straw-colored, and perceptibly elevated in their centres in consequence of the exudation which has taken place into them at these points. The rosy margin of the papule disappears momentarily under pressure, because stasis has not yet taken place in the circulation of this part, nor exudation into the cellular structure of the derma. If the same papules are observed two days later their centres will have become nearly uniformly red, and equally elevated with their borders. Absorption of the exudation has nearly or wholly taken place from the centres of the papules, and the redness returns immediately after pressure, while that of the borders does not entirely disappear on pressure, owing to the commencement of exudation into them. The rapidity,

* Lehrbuch der Hautkrankheiten. Wien, 1869. P. 101; American Edition. Translated by Bulkley. New York. P. 129.

extent, and duration of these phenomena may be so varied as to give rise to an erythema centrifugum, erythema circinatum, erythema annulare, or erythema iris. Erythema papulatum does not necessarily terminate in any one or more of the other forms of erythema. As regards its course and duration, the papules become bluish or leaden-colored, coalesce, and disappear altogether in two or three weeks.

The temperature of the parts affected is sensibly increased, and this continues to be elevated three or four degrees (F.) above the normal condition during the first week or ten days of the disease. The skin is hot and dry to the touch, and a burning sensation is experienced by the patient in the seat of the eruption.

Erythema papulatum appears on the backs of the hands and wrists, on the face, and sometimes on the lower extremities.

Desquamation takes place on the decline of the erythema, and sometimes exfoliation of the cuticle. These phenomena vary with the extent and variety of the exudation.

Hemorrhage into the papules causes pigment stains; but these are not common in erythema papulatum.

Recurrence of the disease is liable, under circumstances similar to those which caused it; such as exposure of the hands to the cold air after having them in warm water; standing in the cold and wet; remaining in damp clothes with wet feet; and sudden changes from warm or dry to cold and moist weather in the spring and fall. Rheumatism is also productive of erythema papulatum.

Young persons, women especially, are more liable to this disease, partly on account of their usual in-door occupations causing them to become more sensitive to exposure. The mode of prevalence of erythema papulatum is generally sporadic; although it may prevail in certain localities favorable to its production, or under conditions of temperature and moisture having a wider geographical range. The sudden thermic and hygrometric changes of our New England climate greatly predispose to erythematous diseases, and among them to this variety of erythema. The Middle and Southern United States are nearly exempt from erythema,

as is shown by the statistics of skin diseases in their large cities.

CASE I. — April 28th, 1870. Benjamin F. Robinson, aged 20, has had erythema papulatum of the backs of his hands for the past two weeks. The disease was slight at first, but now the papules are elevated, somewhat pale in their centres, two or three lines in diameter, and are becoming confluent in places. There are similar papules on the sides of the neck, and in a slight degree on the face. The papules do not itch, but have a burning sensation in them. For the last four days there has been swelling and pain in the left ankle of a rheumatic character, coming on first at night. Patient does not remember ever having rheumatism. He came from the country two weeks ago, and has been employed since then in washing yeast-cans daily in warm water, for one or two hours at a time.

May 1st. Erythema still continues in papular form on the backs of the hands. Rheumatic pains are felt in both ankles. Five grains of the potassium iodide are prescribed to be taken in water after each meal.

May 4th. Erythema is nearly gone from the backs of the hands and from the neck. Pain in ankles is not so severe. Hands and elbows began to be painful three days ago. Now the pain in them is much less.

May 15th. The pain and erythema were both gone three or four days after the last visit. The patient has now been at the same kind of work for one week. Yesterday he began to have pain in his hips and thighs, and the erythema made its appearance again on the backs of his hands. The papules are about three lines in diameter, quite uniform in size, and of a deep rosy-red color. Continue the potassium iodide.

The above case illustrates the effect of occupation in giving rise to sub-acute rheumatism, accompanied by an eruption of erythema papulatum, which returned after exposure to the same cause.

CASE II. — Nov. 5th, 1873. Frank Gilfether, aged 16, an errand-boy, has had, for the last three years, erythema papulatum on the backs of the hands and on the face. The papules of erythema are from one to three lines across, elevated, rosy-red, and some of them with pale centres. He had a similar eruption last winter, for almost a week.

Nov. 12th. Papules are very much faded.

The foregoing case shows the disease to recur during the winter. This variety of erythema is identical with erythema pernio, and is a form of vaso-motor paralysis, produced by exposure of the face and hands to the intense cold of our winter weather.

CASE III. — Dec. 17th, 1873. Frank Crowley, aged 15, has had erythema papulatum on the backs of his hands for more than a week. Vesicles have formed on the papules in the palms of the hands, into the floors of which hemorrhage has taken place. He is spanæmic, and has ulcerative stomatitis of the buccal mucous membrane of the left side of the mouth. About ten minims of the tincture of ferric chloride are to be taken in water after each meal.

In this third case we have an annual recurrent attack of erythema papulatum in winter, with formation of vesicles, and hemorrhage into their contents. Debility and cold weather were the immediate causes. This disease occurred again in the following October, with the same symptoms.

CASE IV. — May 13th, 1874. Kate Scollard, aged 13, has had erythema papulatum for the last four days on the backs of her hands and wrists. The papules are broad, dull-red or purplish, and becoming confluent. She has had her hands in cold water lately more than usual. Zincic oxide ointment was prescribed.

May 16th. The erythema is very much faded, and there are no distinct papules.

The above case is one of recurrent erythema papulatum,

which first appeared in the spring, and, in the following year, in the month of August.

CASE V. — Oct. 5th, 1874. Frank Crowley, aged 16, has had erythema papulatum of the backs of his hands for the last two weeks. There are a few purple or ecchymotic papules in the palms of the hands. He has ulcerative stomatitis of the mucous surface of the lower lip, that commenced with the appearance of the papules. Tincture of ferric chloride is to be taken in fifteen minim doses after each meal.

CASE VI. — Aug. 17th, 1875. Kate Scollard, aged 14, has had erythema papulatum of face and backs of hands for the past two days. There is a burning sensation in these parts, but no itching. The papules are from one-fourth to one-half an inch across. There are, however, only two of the larger size, which are situated on the dorsum of the right hand and of the wrist. There is exudation in the centres of the papules, which are elevated and pale, while their margins present a vivid rose color. When the blood is forced from the skin by stretching it the papules appear straw-colored, and are elevated, in consequence of the exudation which has taken place in them. This patient was under my care a year ago last spring, with erythema papulatum of the hands. (Case IV.)

Aug. 19th. The centres of the patches have become nearly uniformly red, and equally elevated with their borders. The redness of the centres returns immediately after pressure, while that of the borders does not wholly disappear on pressure. The largest papule, or annular patch (*a*), has now become a third larger in diameter, with a deep, rosy-red border, nearly one line in width. The patch (*b*), composed of six or seven confluent papules, giving it a curvilinear border, with the convexity of the curves turned outwards, has acquired a diameter of nearly an inch. There are several isolated papules, that measure a quarter of an inch in diameter. Some of them have annular borders. The isolated erythematous papules and the clusters of coalescing papules or patches are situated for the most part on

the radial border of the right hand, the dorsum of the thumb, the knuckles of the index and middle fingers, adjacent portions of the dorsum of the same fingers, and also on the knuckle of the little finger and first phalanx. The distribution of the erythema is almost precisely similar on the left hand. There is a burning sensation in the parts affected. The temperature to touch is sensibly increased. The papules on the face are not so bright-red as at the previous visit.

Aug. 23d. The patches of erythema are enlarged in diameter, so that the first one (*a*) described in the record of last visit is now about one inch across, and the largest patch (*b*) is one and one-half inches nearly. The patch (*a*) is not quite so rosy-red, except the margin, which is somewhat papulated. The large patch has a purplish tint in the centre. Some of the papules also are purplish, except a narrow line which forms their margin. The left hand is less affected than the right, but is in a similar condition as regards the disposition, size and color of the papules. There are no new papules on either hand, while those on the face are very much faded.

Aug. 28th. Papules are purplish and in decline. Patch (*a*) is three-fourths of an inch in width, and its margin is about one-sixteenth of an inch. The margin is somewhat red, but fading. Patch (*b*) is one and three-eighths inches across, purplish, without redness of margin, which has faded. The temperature of hands is 101.6° F., while the temperature of the room is 68° F. Papules are gone from the face. Palate and throat are somewhat red, and the patient is hoarse. The tongue is clean. Patient had been washing glass-ware in cold water previous to the attack of erythema. She had a similar attack two years ago, and one year ago, from the same cause.

V. *Erythema tuberculatum*. — Willan is the first writer on cutaneous diseases who has given a description of this variety of erythema. He had seen but three cases, all of which were fatal, the duration of the disease being only a few weeks. In two of these cases cerebral symptoms mani-

fested themselves during the second week of the eruption; and, in the third case, about a month after it had disappeared. The first two patients were women, and the third was a girl six years old. The disease commenced with fever of an intermittent type, in the intervals of which there was languor and faintness. During the second week of the eruption the fever was succeeded by weakness, irritability, restlessness, and sometimes hectic.

The eruption consisted of irregular patches of redness and round tumors slightly elevated, from one-eighth to one-quarter of an inch. The tubercles were not painful or disposed to suppurate. They subsided in seven or eight days, but the patches of erythema continued a week longer, turned livid, and finally disappeared. The eruption affected the arms, neck, shoulders, thighs and legs.

Willis describes, under the title of erythema papulatum, and erythema tuberculatum, a disease which he has observed principally among children, during the period of dentition, and in connection with derangement of the stomach and bowels. He says that "erythematous inflammation occasionally appears concentrated in isolated points, of a rounded or oval form, of a very vivid color, and raised like papulæ above the general level; or, otherwise, a number of these papulæ are developed in the vicinity of each other, and becoming connected by their margins, or associated by the meeting of the inflamed rings around their bases, they form irregularly tuberculated patches, of the size of a half-penny, a penny, or a crown-piece. The papulæ and tuberculated patches are evolved with a good deal of pruritus, which appears to have something of the character of urticaria. They reach their height in the course of a few hours, but continue visible for several days, becoming duskier in their hue as they disappear. As one crop of erythematous papulæ begins to vanish, another very commonly makes its appearance, and this may go on for several weeks." The same author also gives a plate which represents the disease on the back, shoulder and arms of a child.

Elliotson, in speaking of erythema, says that "in one variety of this affection there is great redness of the skin, with

hard lumps; not so large as in erythema nodosum, but small lumps, about the size of peas, or small-pox pustules. This is a state of the parts which I have never seen but once, and then I confounded them with erythema nodosum, and thought nothing of it, imagining that I could cure it. The lumps had no sooner disappeared than the man became paralytic, then hectic, and died in an extraordinary way, with symptoms of various diseases."

Dr. Durkee has described two very remarkable cases of erythema tuberculatum, which came under his observation during the years 1855 and 1860. One of these cases he denominates erythema tuberculatum et œdematosum, and the other erythema papulatum et tuberculatum.

The following cases will serve to illustrate the clinical history of the earlier stages or milder forms of erythema tuberculatum. It is impossible to keep trace of these cases and learn the result after they cease to visit the Skin Department. Doubtless the recurrence of the disease in many instances proves fatal. In two well-marked cases of erythema tuberculatum, to which we were subsequently called, death was the final result. A post-mortem examination of one of these cases disclosed an old local peritonitis in the lower part of the abdomen, on the right side. The intestines were adherent in places. This possibly might have been the exciting cause of the disease.

The chronic character of this variety of erythema precludes the possibility of admitting it to the wards of the hospital for a sufficient length of time to observe its varied phenomena and termination. Several cases, however, will be found upon its records, in the diagnosis of which Dr. Durkee has fully concurred. In six thousand cases of skin disease over three hundred cases of erythema have been observed, and of this number forty-two were cases of erythema tuberculatum. Brief outlines of about one-third of the latter are given.

CASE I. — June 5th, 1869. Mary Wood, aged 37, has been affected with erythema tuberculatum of the left leg during the past three years. Two years ago she suffered from neu-

ralgia of the scalp and pleurodynia. At that time she experienced considerable loss of hair. She also had a sore throat for six weeks. There has been no eruption on the skin nor affection of the eyes. The hair is now quite abundant. Amenorrhœa began nearly four months ago, succeeded during the last three weeks by profuse uterine hemorrhage. At present there is less hemorrhage. There have been some symptoms which gave indication of uterine polypus. She is admitted to the surgical pavilion for more thorough examination.

CASE II. — Dec. 16th, 1869. Joseph Hunt, aged 32, has a few small, dull-red and bluish-looking tubercles on the external border of his right foot, accompanied by erythema of four or five weeks' duration. The left foot has been swollen and erythematous. There was some tenderness of the ball of the foot at the time. He has had wet feet for a long time. There is no history of any disease anterior to the present one.

CASE III. — Dec. 16th, 1869. William E. Preble, aged 27, has had erythema tuberculatum of his left leg during the past four days. Both the anterior and posterior portions of the leg are affected. The erythema is most marked about the middle of the leg. There is also a large erythematous patch situated on the inside of the leg just below the knee. There is pain in the leg, groin, and lumbar region. The glands in the groin are slightly enlarged. The eruption is scarlet, with large papules becoming tubercles. Patient thinks the pain resembles that of rheumatism. He has recently wet the left foot in snow-water more or less. He had rheumatic fever three years ago, in which his hands, feet, and legs were affected. The disease lasted from March until the middle of June. He has never had any venereal disease.

CASE IV. — Dec. 10th, 1870. Bridget Murphy, aged 30, has erythema tuberculatum of three months' duration. There is deep, dull redness, with a few isolated tubercles scattered over the ankle. The tubercles gradually become effaced by

slight breaking down of their centres. Patient says that nothing at all comes out of them. The leg becomes very red and painful while standing. There is much less redness when the leg is at rest in a horizontal position, either in bed or in a chair. Eight years ago she had rheumatism for four months, more or less general, but especially in wrists and hands. The rheumatism was accompanied by fever. Now she has occasional pain in both shoulders. The leg cannot be indented on pressure; but there seems to be a fulness or thickening of the deeper portions of the skin, resulting from the prolonged hyperæmia, etc. She is admitted to one of the medical pavilions.

CASE V. — Dec. 12th, 1870. Kate O'Brien, aged 31, has erythema tuberculatum of both legs, of two years' duration. Her legs suddenly became red and swollen and covered with deep-red tubercles, scarcely at all elevated above the skin, but apparently occupying its deeper portion. Blood has oozed from several of them that were slightly eroded at their apices after the patient has been standing for a long time. The tubercles are exceeding vascular. Her arms have been red and swollen, and tubercles have formed on them for the past two years. There has been no hemorrhage from these. A burning sensation is felt in the erythematous and tubercular portion of the skin; and occasionally there is a slight amount of itching. The patient has lost some hair. She never had any eruption on the skin, except a few boils on the scalp when a child. She is admitted to the surgical pavilion.

CASE VI. — Dec. 12th, 1870. Karl Wisterberg, aged 35, has had erythema tuberculatum of foot, ankle and lower half of leg during the past eighteen months. Several dull-red tubercles, about the size of ordinary peas, and others smaller, are situated on the outside of the ankle, above and below the external malleolus. There is pain in the leg, and swelling at night, which subside before morning. A gangrenous condition, with excessive odor, has existed at the base of the great toe for a month. The redness extends

from this point to the dorsum of the foot. Patient has never had any skin-disease on the body, but there are a few oval and circular cicatrices on the back of the neck of a very superficial character. There is a slightly ulcerated patch, one-half an inch across, near the seventh cervical vertebra. There is pain in the leg, and the patient says his "foot feels as it were in ice, or dead." When the patient sits down in the evening for a while his feet "get asleep." He has incontinence of urine at times. Has never had any venereal disease. Admitted to the surgical pavilion.

CASE VII. — Dec. 12th, 1870. Sarah McGuiness, aged 40, has erythema tuberculatum of her right leg, of two months' duration. There is general redness of the leg, with a few tubercles about the size of small peas, and deeply situated in the skin. The arterioles of the skin are enlarged, pink-colored, in consequence of a long-continued congestion of the skin. The patient is a washerwoman, who is almost continuously standing, and is daily exposed to sudden alternations of heat and cold.

CASE VIII. — April 22d, 1871. William Drohen, aged 52, has had several attacks of erythema tuberculatum of his left leg during the last ten years. Occasionally the leg has been swollen and painful. There has never been any moisture. There is some œdema at the present time. The tubercles are scattered around the ankle and heel. A few of the tubercles are slightly broken down at their apices.

CASE IX. — Feb. 20th, 1875. Thomas Gagan, aged 50, has had erythema tuberculatum of right leg about two years. The tubercles are situated in erythematous patches, nearly covering the inferior and anterior portions of leg. There has never been any moisture. There is a burning and somewhat itchy sensation in the affected region.

March 13th. The disease is about the same. It has been treated since the previous visit by the application of zinc ointment. This treatment is to be continued, and fifteen

minims of tincture of ferric chloride given internally after meals.

March 20th. The skin is red in patches, with dull-red tubercles here and there. Several years ago the patient had chilblains, or erythema pernio.

April 7th. Less erythema. There are a few thin, scale-like crusts on a few of the eroded tubercles, or those which have partly subsided.

April 19th. Redness is less, and so also is the burning sensation. The tubercles, however, remain nearly unchanged. Continue the same treatment.

May 1st. General health is much improved. The erythema still presents a dull-red appearance.

May 22d. Redness continues; but the tubercles are less prominent. Cramps in legs at night. At the age of fifteen had deep ulcers, or sinuses, below left knee. No bone was ever discharged from them. Now has depressed cicatrices. Five grains of potassium iodide are to be given in water after every meal, and the zinc ointment still applied.

June 8th. Leg is red and tubercular. Continue treatment ordered at previous visit.

July 22d. Less redness. Continue the same treatment.

August 5th. Tubercles are depressed, and there are patches of erythema around them. There is a tawny, yellow discoloration between the erythematous patches. Several of the tubercles have a bluish tinge in their centre.

CASE X. — April 29th, 1875. Bridget Dooley, aged 35, has erythema of left leg, of one month's duration. The leg is of a deep purplish-red color, and is very painful. The tubercles are of a deeper redness than the surrounding erythema. There are five small superficial ulcers on the diseased leg. There is apparently no discharge from these ulcerations. This patient was seen by me about seven years ago. At that time she had an attack of erythema of the leg when nearly at the end of gestation. Since then she has given birth to four children, and is now nearly at full term of pregnancy.

CASE XI. — Apr. 30th, 1875. Johanna Sullivan, aged 56, has erythema tuberculatum of the right leg, of five months' duration. The erythema and tubercles are situated on the anterior portion and sides of the leg. The tubercles are rather smaller than usual, being only about two lines in diameter. The disease came on after exposure, the feet having been wet in snow-water. There are occasional pains in the leg.

May 8th. The erythema is on the decline. There is some oedema of the leg.

June 8th. Erythema still remains. There are a few new tubercles. The pain in the leg is quite severe in damp weather.

July 13th. There are several dull-red tubercles, which are embedded in the skin.

July 31st. A few dull-red papules beneath the right knee. Some pain in the ankle.

Aug. 7th. Yesterday the right leg became swollen and painful.

CASE XII. — Apr. 10th, 1875. Enoch H. D., aged 55, has erythema tuberculatum of the left leg, which began about the first day of January. The affected skin is scarlet-red, and the tubercles are purplish-red, and scattered over the anterior surface of the leg. The patient complains of a feeling of "stiffness" or tension in the skin; which, nevertheless, is somewhat elastic, except on deep pressure. There is some enlargement of the left leg, its circumference being nineteen inches.

Fifteen years ago the patient had dysentery, and subsequent swelling of the left leg. During the year 1847 he was employed on a section of the City Water Works, and was at work in the water much of the time for several months.

Apr. 24th. Erythema extends to the knee, and the tubercles are very numerous over the anterior and inner surfaces of the leg. Skin of leg is firmly congested, but elastic, except to deep pressure. There is considerable oedema (erythema oedematosum) of the deeper portions of the skin.

A slight amount of free exudation has taken place from three or four of the tubercles, which are now covered with thin crusts. Patient feels dizzy, and has to lean forward when walking. On leaning backward he becomes dizzy, and is liable to fall. This symptom first made its appearance about eight months ago. The least mental excitement causes his mouth to become so dry that he is unable to speak. He is very thirsty all the time, but all kinds of drink taste bitter. Since his first visit he has taken a pill containing one-twentieth of a grain of arsenious acid after each meal. He has also applied a powder to the leg composed of oxide of zinc and starch. The erythema seems to be somewhat less since the use of the powder.

May 1st. Erythema is about the same as at last visit; so, also, are the tubercles. There is less cedema of the leg. Patient is still dizzy; but his mouth is better, there being more moisture since the use of the biborate of soda prescribed at the last visit.

May 8th. Considerable cedema. Erythema and tubercles are about the same as at last visit.

June 19th. Less cedema and redness. Head is still dizzy, especially in the forenoon. Passes much urine. Bowels regular. Mouth dry. Patient has been wearing an elastic stocking for the last ten days. This has caused the cedema to diminish somewhat. Resume arsenic pills; one after meals.

CASE XIII. — July 10th, 1875. Ellen Hagerty, aged 37, has erythema of the right leg, which began during the first week of last August. There is a general deep rosy redness of the leg, the skin of which is thickened, and studded with tubercles of a deep red or somewhat purplish color. The leg has a bluish appearance at times. There is occasionally a lancinating and burning pain in the seat of the disease.

July 17th. There are some new patches of erythema; otherwise the leg is in nearly the same condition as at previous visit. A few depressed cicatrices, without pigment, are noticed on the upper part of the leg. Fifteen minims of

the tincture of ferric chloride in water are to be taken after each meal, and the oxide of zinc ointment applied daily.

July 20th. The erythema of the upper portion of the leg is of a deeper tint, and there is a burning sensation in the diseased portions of the integument. Five minims of liquor arsenicalis are to be taken in water after each meal. Continue the iron and ointment,

July 24th. Erythema is about the same, and quite painful. There is an œdematous and very rosy patch on the inner and superior portion of the leg. Less of the burning sensation is felt. Continue the medicines and ointment.

The last two cases are examples of erythema tuberculatum et œdematosum.

VI. *Erythema nodosum*.—Erythema nodosum usually affects the fore part of the legs. Willan says he has seen it in females only. It is preceded by irregular shiverings, nausea, headache, fretfulness, quick pulse, and white fur on the tongue. These symptoms continue a week or more, until the appearance of the erythema, when they usually abate, giving place to languor, thirst, and disrelish for food. In some instances the disease appears without any marked constitutional disturbance, and runs a very mild course. It makes its appearance in the form of papules and patches of redness, the latter of which become the nodules, or nodes, from which it derives its name. The nodes are situated on the anterior surfaces of the legs, and on the extensor surfaces of the fore-arms, especially on the ulnar borders. The papules appear on the neck, face, and various parts of the body.

The characteristic lesion, which is the node, is a rosy or dull-red elevation, oval in figure, and the longer axis parallel with the tibia, and situated directly over it. These nodes are caused by serous effusion, and more or less hemorrhage into the deep layers of the corium and areola tissues. The purple and yellowish colors, which they subsequently present, are in all respects similar to those after contusions. The nodes are painful to the touch, or pressure, but other-

wise do not cause much inconvenience. They are successive in their eruption, so that the disease may last two or three weeks. In severe cases the patient is obliged to keep in bed during the acme of the disease.

Erythema nodosum appears to be in some way associated with rheumatism; whether there is any close relation between the two diseases remains to be demonstrated. We have observed its appearance in rheumatic families, and at seasons of the year in which acute rheumatism prevailed.

In this region, erythema nodosum is most prevalent during the months of March, April, May, October, November, and December. These are the months in which there is the largest amount of moisture and cold, together with the most frequent changes in temperature. Three-fourths of the cases occur during these months.

CASE I. — July 17th, 1869. Martha McC., aged 26, came under observation in my clinic for skin diseases at the City Hospital, with an eruption of erythema nodosum, situated on the anterior portion of both legs and the ulnar borders of the fore-arms. The nodes on the fore-arms as well as those on the legs were quite elevated and tender. Their centres were not so red as their borders. Pain had been constant in the arms and legs for six days. There had also been pain in the back of the neck, and occasionally in both sides of the thorax. The tongue was somewhat coated. The patient was admitted to one of the medical pavilions for treatment.

CASE II. — Oct. 29th, 1870. Catherine Scollin, aged 13, came to my clinic with erythema nodosum of the left leg, of three days' standing. The disease was very painful; most of the pain being in the groin. The leg was covered on its internal and external aspect with rosy patches of erythema, which were somewhat raised above the surrounding surface, and in several places were becoming confluent. There were febrile symptoms. The pulse was 104. There was a slight white fur on the tongue, and loss of appetite for two days. The patient was admitted to one of the medical pavilions.

CASE III. — Nov. 5th, 1870. Mrs. Selma Oldsen, age 30, was confined four and one-half weeks ago. The patient was never before sick. Three and a half weeks ago she had a small abscess of the left mamma, which is now entirely well. There is a thin white fur on the tongue, loss of appetite and thirst. The pulse is 100, full and regular, and the patient perspires profusely. Four days ago patches of redness were first noticed on the anterior portion of the left leg. These erythematous patches soon developed into nodular elevations characteristic of erythema nodosum. There was pain in the affected parts twelve hours previous to the appearance of the erythema. Two days ago, papules and patches of erythema, succeeded by nodular elevations of the erythematous portions of the skin, began to appear on the left arm and the right leg, preceded and accompanied by pain and tenderness of the parts as in the previous attack of the left leg. The patient has never been affected by rheumatism, nor have any of her near blood-relations.

CASE IV. — May 15th, 1871. Mary A. K., aged 40, came to my clinic with painful erythematous patches and elevations of erythema nodosum, situated on the outer borders of the fore-arms, and of about a week's duration. There was pain also in the lower extremities, the spine, and in the right shoulder. There was a purpuric or ecchymotic appearance of one of the ankles, and outside of the foot, near the heel. The patient had suffered from "cold perspirations" at night.

CASE V. — Nov. 16th, 1871. Jas. A. T., aged 25, had been affected with erythema nodosum nearly two weeks. He does not know that he ever had rheumatism. He has had a severe headache, and been feverish since yesterday evening. His pulse is 88, and his tongue is clean. Patches of redness began to appear nearly two weeks ago on the anterior portions of both legs. Erythematous nodes succeeded, with the usual painful condition characteristic of erythema nodosum. The patient complains of a feeling of lameness, especially at night, in the hollows of his arms,

in the right little finger, and also in the left hip-joint. The nodes are on the decline, and are surrounded by a yellowish stain, produced by blood pigment.

CASE VI. — May 24th, 1872. Annie Morton, aged 23, was seen by me in Ward G, bed 16, medical pavilion, with erythema nodosum of ten days' duration. The anterior portion of the legs, the region around the knees, and the extensor surfaces of the fore-arms, were the parts affected. The patient had wet her feet on the Sunday previous to the appearance of the erythema. The first node commenced as an erythematous patch on the inner surface of the left knee, and reached the dimensions of a hen's egg before the others began to appear. On the succeeding Friday erythematous patches were noticed on the legs, and, in a slight degree, on the arms. The patient had pain in the legs, and was unable to walk. She never had rheumatism. Her menses are regular, and have been present for the past two days.

CASE VII. — Dec. 10th, 1873. John Smith, aged 11, has erythema nodosum, of one week's duration. The disease has been painful from the first appearance of the erythema. The erythematous nodes are situated on the anterior portions of the legs, while about the knees the disease consists, for the most part, of broad papules and patches of redness, scarcely enough swollen to be considered nodes. Those on the anterior portions of the legs are quite characteristic on account of their redness, tenderness, pain, and elevation above the surface of the healthy skin. The appetite is fair, and the pulse 96. There are no marked febrile symptoms.

CASE VIII. — Oct. 10th, 1874. Eveline C., aged 8, has had erythema nodosum during the last six days. The parts affected are the anterior portion of the legs and the extensor surface of the fore-arms and back of the hands. The erythema began on the arms, near the shoulders, and extended downwards to the dorsum of the hands. Some of the nodes on the legs are in their decline, and have assumed a purplish tint. Those that are still erythematous are tender to the

touch, and their temperature is perceptibly higher than that of the healthy skin. The sensation of heat in them is felt by the patient. This patient had been affected with diarrhoea for three or four weeks, which ceased about a week previous to the attack of erythema. A drachm of wine of iron was given three times a day, on account of the excessive spanæmia.

Oct. 17th. Purplish tint in places on legs and arms. Pain has entirely ceased.

CASE IX. — June 11th, 1866. Mrs. M., aged 23, generally enjoys excellent health. One week ago to-day patient awoke with stiffness about the muscles of the neck, sore throat, loss of appetite, and pain in back of neck and head. These symptoms abated on the second day. About four days ago pain commenced in occiput and over coronal suture, and has been quite severe until to-day. Menses appeared this morning. Three days ago patient began to have pain in knees and the anterior portion of right ankle. Erythematous patches soon appeared on the left knee. These patches vary in size from half an inch to one inch in breadth, and are surrounded by a rosy blush, which nearly covers the knee. The patches or nodes themselves are of a deep rose color, elevated in the centre, hard, and very painful to the touch. A similar node, about the size of a chestnut, is situated on the left thigh, near the left hamstring. On the right knee are four nodes, nearly an inch in diameter, elevated, hard, and painful to the touch. On the anterior of the right ankle are two nodes of about the same size as those on the knee. They are quite red, and are tender to the least pressure. There are papules of various sizes on the extremities, or rather nodes, in an early stage of development. The pain is severe at times, and lancinating in the knees and ankles. Patient is nervous, despondent, uncertain in memory, and foreboding.

June 14th. Patient has some appetite to-day. Menses have been very profuse during the past two days. The erythematous nodule, near the outer hamstring of the left thigh, is now nearly two inches in diameter. Its central portion is

somewhat darker than the rest, and is exceedingly tender to the touch. The left knee is covered by a cluster of nodular patches about five inches in diameter. Its border is of a dull red color, while the centre, about three inches in diameter, is yellowish and very tender, especially one of the nodes on the inner and lower border of the patella. On the outer border of the left thigh are two patches of redness, about half an inch each in breadth, and over the outer and lower third of the same thigh are eight hard red papules, not yet painful to pressure, but giving to touch the sensation of little nodules in the skin. Three papules or nodules of similar character are situated on the middle, near the outer border, of the left leg. On the anterior and lower third of the right leg are four or five red patches, each an inch in diameter, nearly confluent, constituting a group about three inches in breadth. Above this is a patch or node of erythema, which has become yellowish in its centre, and is one and a half inches in its transverse, and two inches in its longitudinal measurement. These patches are elevated, hard, and very sensitive to pressure. There are ten papules on the back of the right forearm, and nine on that of the hand. These papules are of a deep rose color, and from two to three lines in diameter. There are thirteen papules, similar in size and color, on the dorsum of the left fore-arm. Nearly all of the papules just described have appeared to-day, and are not yet nodular to the touch.

June 16th. The larger nodes have a dark purple appearance, which causes them to resemble so many contusions. There is some swelling over the outside of the right ankle, and considerable pain. Near the outer and lower portion of the left thigh there is a new patch of erythema, about an inch in breadth, bright red, and painful to the touch. There are a few new papules also on the external portion of the same thigh, and several on the anterior and outer portion of the left leg. Patient has some pain in knees, legs, ankles, and elbows, a slightly furred tongue, is nervous and forgetful, but is able to sit up a portion of the time, and even move about the room.

June 17th. The pain has nearly ceased, and there are no

new eruptions of erythema. The patient has taken half a drachm of potassium acetate in half a glass of cold water, three times a day, since the first visit. This remedy was given on account of the rheumatic character of the pains.

VII. *Erythema centrifugum*.—The variety of erythema known as centrifugum is described by Biett as peculiar to young persons, and especially females. It makes its appearance as a small red spot or papule, gradually assumes the form of a circular red patch, with elevated border, while the centre is depressed, and retains the normal color of the skin. From the size of a shilling it sometimes spreads over the greater part of the face. There is heat in the part, but no pain or itching. The disease is chronic, and each patch leaves a slight depression in the skin. We are not familiar with this form of erythema.

The description suggests the possibility of its being either a herpes circinatus, or lupus erythematosus. We do not see the necessity of the term centrifugum, since the words marginatum, circinatum and annulare cover all these forms of erythema, which gradually develop outward from a centre.

VIII. *Erythema circinatum*.—The circinate, annular, and iris-form varieties of erythema are of so rare occurrence that little is known of their clinical history. In some of their stages of development they are liable to be confounded with herpes circinatus and herpes iris. Those, however, who are familiar with the latter diseases are little liable to this error.

Erythema circinatum most frequently occurs on the inside of the fore-arms. The rings may attain the diameter of about an inch. They then become broken, or unite at their borders, so as to form an irregular margin, composed of rings and their segments, which is several inches in length. The centres of the rings, and those portions of the skin over which they have traversed, are slightly tinged with yellow, by the exudation which has taken place. The eruption is far less extensive than that of urticaria annulata vel perstans; and the rings and segments cannot for a moment be compared with the gigantic productions of the latter disease.

The time occupied in the development of the two diseases, their color, duration, subjective phenomena, causes, and concomitant affections, are amply sufficient to distinguish them.

CASE I. — Sept. 21st, 1875. John K., aged 21, has been affected with erythema circinatum about five days. The disease is situated on the inside of the fore-arms and to a less extent upon the dorsal surface of the hands. The temperature of the skin is perceptibly increased as regards the touch and subjectively. Patient says there is no itching. There are several rings on the inside of the fore-arms nearly an inch in diameter, with straw-colored centres and deep rosy-red margins. They are arranged somewhat irregularly, so that when they coalesce they form a continuous serpentine line nearly four inches in length.

IX. *Erythema annulare et iris*. — Professor Wilson describes a form of erythema which he denominates erythema annulare, and which is apparently unknown to us. It differs both in size and duration from the variety observed here. The rings are much larger, more persistent, and give rise to exfoliation of the cuticle. He reports a case in which it was recurrent in the same person two successive years, lasting from one month to six weeks. There were no other symptoms than derangement of the alimentary canal, and the disease was apparently without external cause. He has given a striking picture of this form of erythema in his "Portraits of Skin Diseases."

The form of erythema seen here, and which corresponds most nearly to the above disease, does not differ essentially from the erythema iris of Professor Hebra, except that the rings are larger and less elevated in proportion to their size than those of the latter. We have observed erythema annulare on the body in two cases of rheumatism, its duration being only a few days. The rings, in these cases, were about an inch in diameter, and of a deep red color. They appeared to be caused by capillary turgescence, with very little, if any, serous exudation into the elevated ring.

SCLEROSIS OF THE SPINAL CORD.

BY S. G. WEBBER, M. D.

It is not my intention to give a detailed account of the history of the progress made in investigating the group of diseases which are found to have as a common basis sclerosis of the spinal cord. Necessarily the study of these cases had to wait for an improved method for examination of the nerve-centres, and the pathological anatomy of sclerosis was almost unknown until after Lockhart Clarke published his method of staining and clearing up the cord. Previous to this time the gross appearances were recognized, and the group of symptoms known as locomotor ataxia had been differentiated by Duchenne, and had been previously recognized in Germany under the name *tabes dorsualis*; but it was after Duchenne's work (1858-59) that a new impetus was given to the study of this combination of symptoms, at first clinically, later histologically, by Leyden, Friedreich, Topinard, Dumenil, Charcot and his pupils, especially Joffroy and Pierret. This form of sclerosis is now comparatively well known to the profession.

Sclerosis of the antero-lateral columns, or sclerosis in patches, was studied in both Germany and France. In the former, Zenker, Leyden, and Valentiner, advanced the knowledge of the profession in regard to the pathology and symptomatology of this affection; but we are yet more indebted to Charcot and his pupils, especially to Ordenstein, Bourneville and Guérard, Joffroy and Pierret. And while mentioning these names connected with the French school, I do not wish to be understood as denying that we have gained much from the observations of more recent German writers, as Bärwinkel, Schüle, Leube, Otto, Ebstein.

Quite recently Charcot* has published the description of another variety of sclerosis, "sclérose latérale amyotrophique."

Thus there are already three diseases or pathological entities differentiated wherein spinal sclerosis is the morbid change. If to these there is added, under sclerosis, the subdivisions, cerebral (?), cerebro-spinal, and spinal, the varieties are increased to five. Shall we also divide locomotor ataxia, or sclerosis of the posterior columns, into "sclérose fasciculée systématique médiane, ou sclérose des cordons de Goll," and "sclérose fasciculée latérale des cordons postérieurs ou sclérose des bandelettes externes"? Following the same plan of subdivision, it may be necessary eventually to subdivide sclerosis of the anterior columns. Hallopeau has also described a "sclérose periependymaire," and a "sclérose annulaire." It is simply ridiculous to make so many subdivisions, especially as many of them are not differentiated by their clinical history. It is convenient to divide sclerosis into posterior and antero-lateral; for the symptoms are widely different. Whether Charcot's amyotrophic lateral sclerosis will be finally accepted as a proper subdivision remains to be seen. Yet it must be borne in mind that these different varieties run into each other, and that cases will arise in which the symptoms are so mixed that it will be very difficult to decide to which they belong. The spinal cord is a complex organ, fulfilling different offices, and the symptoms will vary according to the locality of the lesion.

There have been lately, or now are, in the hospital cases which illustrate each of the three subdivisions above spoken of, — sclerosis in patches, locomotor ataxia or sclerosis of the posterior columns, and Charcot's newly named amyotrophic lateral sclerosis. It will be interesting to compare the symptoms of these three cases, especially as each is a classical case of its variety.

CASE I. — *Sclerosis in Patches in its early Stage.* — Wm. E., sailor, aged 23, has had his present trouble since an

* Leçons sur les maladies du système nerveux faites à la Salpêtrière. 1874. Page 227.

attack of typhoid fever two years ago. Previous to that sickness he enjoyed good health. He drank considerable, but mostly beer; he also masturbated. He was in the hospital five weeks for the typhoid fever, and before leaving noticed a trembling of his left hand. It was very slight at first, scarcely perceptible to any one but himself, and was most marked when he used his hand; when it was at rest he did not notice the trembling. About two or three months later the trembling was noticed in the right hand; and a month or so later, in the legs. After leaving the hospital he worked on a steamboat as fireman, being afraid to go aloft on account of the trembling. Hard work or excitement increased the trembling. He gradually grew worse, and when the cold weather commenced the trembling had become much worse. He stated that he had lost some strength, but not much.

In the hospital, when sitting, there was a constant agitation of the whole body, caused, apparently, by the vibration of the arms, legs, and head. This trembling was most severe in the hands; and when he was told emphatically to stop it, the trembling was only increased and became excessive. A powerful grasp of a fixed object, as the iron rod of a bedstead, steadied the hand, but the arm at the elbow continued to tremble. Every voluntary motion was accompanied with this trembling. But when he was not thinking of himself, his attention being directed elsewhere, the trembling was less. In the morning, also, before rising, there was no trembling, but it returned when he commenced to dress. The pupils acted well, and were of equal size; the eyes moved naturally; there was no nystagmus. When shut, the lids trembled; but when open, they did not. The facial muscles acted naturally; the tongue was protruded straight and scarcely trembled. He walked and stood well with eyes shut, but was made slightly dizzy. There was, and had been, no abnormal sensations of any kind, and no pain; he thought the senses of touch and temperature were as good as ever; and touch, as tested by compasses, was normal in the hands. When he lay down, the trembling ceased in the arms and legs almost immediately, as soon as he took an

easy position in which all the muscles were at rest ; but there was a slight vibration still of the head, which did not seem to rest so easily.

This case is of interest, from the absence of symptoms, trembling during muscular action being the most prominent symptom. Yet the slight weakness, the dizziness, and the character of the trembling, are especially significant, and these all grew progressively worse.

It would be interesting to compare with this a case which progressed regularly to a more advanced stage, and exhibited the later symptoms ; but, rather than this, I have selected from my private practice a case which is of especial interest, as showing an unusual and deceptive commencement, the cerebral symptoms being much the more marked. In the later stages, however, the characteristics of cerebro-spinal sclerosis appeared, and this diagnosis was confirmed by an autopsy.

CASE II. — *Cerebro-spinal Sclerosis, at first simulating Cerebral Tumor, later clearly defined. Autopsy.* — Mrs. W., aged 22, was seen January, 1874, at the request of Dr. Langmaid. She was always far from robust, but never feeble ; she seldom lost a day at school, studied hard and stood well. Catamenia appeared at 12 years, and she left school at 14. Up to that time there had been no disturbance of menstruation. She then entered a store as a store-girl, stood up behind the counter, and was not allowed to sit down ; even during menstruation, if able to be in the store, she was obliged to stand. She served in this capacity three years, during which she began to have "faint" spells, or fits ; these were attended with some convulsive action ; she also began to have dysmenorrhœa. During the next four years she was cashier, and could sit down more ; during this time she had fewer "faint" spells. About one year ago she had trouble in the right ear, which finally discharged ; about the same time she had slight headaches, and was dizzy in the morning. About three months since the dizziness was very severe, but subsequently it gave less trouble ; at

that time there was ptosis of the right eyelid and numbness of the left thumb; the latter had been noticed previously. There was also numbness of the left leg; if touched, it felt as though a glove was on the hand touching it. The ptosis passed off; there was developed a weakness of the left arm and leg, also double vision. During the last three months there have been occasionally headaches, but not lately.

When the patient was first seen, her face was drawn to the right; the forehead was wrinkled, most on the right; the pupils acted well, perhaps the right a little more sluggishly than the left; both eyes closed and opened naturally; the left eye was turned inward, and when following the finger, moved with a jerky motion, and was turned outwards not quite so far as the right. The tongue, large and flabby, was protruded straight. There was double vision to the left of the median line, not to the right; vision was less clear with the left eye. Hearing was very acute, but uncertain. The motions of the left hand were less precise than those of the right. She walked with an uncertain gait, especially if the eyes were closed; and she could not stand with her eyes shut and her feet together. Sensation, as tested by the æsthesiometer, was less acute on the left side in the face and hand. No trouble of deglutition nor of respiration. Digestive functions normal.

The ophthalmoscope showed the right papilla redder than the left, veins larger than normal in both eyes, as compared with the arteries.

The diagnosis made was tumor of the brain on the right.

The patient was heard of occasionally as having nearly recovered, and she certainly improved remarkably, and was able to walk alone in the street.

She was seen next in July, 1875, at which date the disease had progressed to such an extent as to leave no doubt that it was sclerosis. The date at which the increase in the severity of the symptoms commenced was not obtained. She lost power in the limbs, the right leg becoming worse than the left; there was much trembling of the hands, especially when she tried to use them. There was no headache, but a sense of pressure in the head; no pain in the limbs. She

had no strabismus. When seen, there had been a diarrhœa for a few days, and she was in bed. The emotions were much excited on seeing me, and there was evidently a slight mental weakness. The arms and head were violently agitated on the slightest motion, and even the effort to maintain a position in bed partly on one side caused a continuous trembling. While in bed the legs were quiet; but when sitting up they trembled. Walking was almost impossible; she required support, and walked with the feet widely separated. Speech was much interfered with. Sensation was not tested carefully, but was not impaired to any great extent.

She was seen again May 25th, 1876. She had been worse, scarcely able to swallow, a short time previously, but when seen had improved somewhat. The trembling was less, but the legs were almost powerless. She could talk better than when seen a year before; but there was more of the peculiar jerking staccato movement spoken of as "scanning." The right leg was at times drawn up by the involuntary contraction of the muscles; reflex action was more marked in the right than in the left leg. There was diminished sensation in both legs. There was marked nystagmus. The mind was evidently affected, there being some weakness of mental power, a certain silliness, and a loss of judgment as to the fit relation of things. There was incontinence of urine and a large bed-sore. During the last months of sickness she lost the sense of taste. During the last month she had rigors. Pulse, 120 to 138. Respiration rapid. She died June 16, 1876.

An autopsy was secured, by the exertion of Dr. Langmaid, twenty-four hours post mortem. Rigor mortis marked. Only the brain and spinal cord were examined. The brain was comparatively small for the cavity of the skull, but the convolutions were not atrophied; the sulci were not open; the brain seemed to have shrunk *en masse*; the space left vacant thereby was filled with serum, with which the arachnoid was infiltrated. The brain was very firm in consistence (the body had been well kept on ice). Throughout the cerebrum and cerebellum, scattered through the white sub-

stance, were numerous patches of sclerosis, varying in size from a minute point to spots as large as a bean. These spots were very similar to the gray substance in color, being slightly redder in tint; they did not differ materially in consistence from the surrounding white substance. None were seen which seemed to arise in the gray substance, though some in their growth apparently encroached upon it. These spots were most numerous on the right side. The right corpus striatum was much changed by a very large patch, and the corpus dentatum of the right cerebellar lobe was almost entirely involved in another. On the left the corpus striatum and the corpus dentatum were nearly normal. Several patches showed on the external surface of the pons, most on the right. The floor of the fourth ventricle also showed patches, and the *iter e tertio ad quartum ventricululum* was surrounded by a patch. There were some patches in the medulla.

The cord was unusually firm, but everywhere on the surface and on section was of the normal color, and seemed healthy. It was put in alcohol, to which tincture of iodine had been added, and after a few days was removed to a solution of bichromate of potassium. After a few weeks patches of sclerosis could be distinguished by the change of color, the altered issue being of a much lighter yellowish-brown.

The diagnosis, when this patient was first seen, was cerebral tumor, and this seemed to be justified by the perfectly unilateral character of the symptoms, as well as by the dizziness, the faint spells, the headaches. When seen the second time, the symptoms were no longer unilateral, and there was no doubt as to the nature of the affection. The trembling was characteristic, but there was also inco-ordination of the lower extremities, a condition resembling locomotor ataxia. At the third visit other symptoms of sclerosis were to be seen: the "scanning" speech, nystagmus, involuntary contraction of the muscles.

The autopsy explained fully the early mistake; the lesion was very much more extensive on one side of the brain than on the other, and involved on that side the great motor

ganglion. The ataxic symptoms were explained by the lesion of the posterior columns, the sclerosis having spread so as to affect these.

CASE III. — *Locomotor Ataxia in its early Stage.* — T. B., aged 58, was admitted October 24, 1876. His health had been good until pains in the legs began several years ago, but at first they were fugitive. Two years ago the pain set in suddenly in the feet, with switching and jerking of the legs. After persisting for a while, the pain subsided, leaving a sense of numbness, which persists. Two months ago numbness suddenly began in both buttocks, and extended over the upper third of the thighs anteriorly. On testing the power of co-ordination by asking him to walk with eyes shut, it was found that he staggered very much, and he could not stand with his feet together and his eyes shut. There was no trembling.

This is an interesting case, as showing the difference between sclerosis of the antero-lateral columns and of the posterior columns in the earlier stages. The following case from my note-book gives an example of a patient in whom the disease had advanced so far that he was practically confined to the bed and a chair; walking was impossible; yet there remained a considerable degree of muscular power; he could support himself, but could not stand, as the power of co-ordination was almost entirely lost. In neither of these cases was pain a very prominent symptom, not as some patients describe it, "horrid," appearing some years before other symptoms.

CASE IV. — *Locomotor Ataxia in advanced Stage.* — C., aged 43, was seen in 1869. When 21 years old he had an attack of nervous exhaustion; his business required him to walk much, but he was never exposed to wet and cold. The first symptom of the present trouble showed itself five years ago, — a sense of numbness in the soles of the feet, mostly on the left. The numbness was confined to the soles of the feet from three to four months, and then extended up the

legs to the knees, mostly on the left. Two and one-half years ago he found out accidentally that he could not stand with his eyes shut. He had no pain until about two years or more ago, when there occurred a grinding, tearing, twisting pain in the left leg, seemingly in the bone; this came in paroxysms. Some months ago he had cramps in the plantar muscles of the left foot. A few months later the right foot was first affected with pain and cramps; now both are equally affected. The numbness has extended upwards to the lower ribs, and the trunk muscles give way suddenly. There has been jactitation of the feet; but that is less now. When noticed by others he cannot walk so well as when he is alone. The limbs moved well in bed, but he could not put his feet down at a designated spot except after several trials, and then not lightly. When he tried to stand, his feet flew out sideways, and he required support. It was impossible for him to walk. Any unusual exertion during the last three years has caused palpitation.

The outer edge of the hands is numb; feels as if a glove was drawn over it; this sensation does not extend to the arm. There is no ataxia of the hands unless he is looked at or is anxious to do well. There is a slight pricking in the hands.

Sight has been affected during the last six months; now the right pupil is larger than the left, but both react to the light.

There has been habitually constipation; once incontinence of urine, but now control over the bladder has been regained.

He thought that the senses of touch, pain, and temperature were normal; but on testing the legs it was found that the right was less sensitive than the left, two points being felt on the left calf at $1\frac{3}{16}$ inch apart, on the right only when $1\frac{7}{8}$ inch; on the dorsum of the left foot, two at $\frac{5}{8}$ inch, on the right at 2 inches.

The phenomena of delayed sensation were interesting. The full impression of a point was not received till a few seconds after the application, and the sensation of contact persisted several seconds after removal of the instrument.

The next case very closely resembles the cases described by Charcot as "amyotrophic lateral sclerosis." I believe no such case has yet been reported in this country. Charcot has only lately differentiated this from progressive muscular atrophy.

CASE V. — *Sclerosis of Lateral Columns with Muscular Atrophy.* — Annie F., aged 17, entered hospital October, 1876. She says she worked where it was cold and wet; has had sick headaches since she can remember, occurring every two or three months; and about two years ago she was troubled thus a great deal; the pain was unilateral, but the side affected varied with the different attacks. In August, 1875, her feet were frequently wet, and after wearing new boots, which were rather tight, she noticed that the right foot dragged in walking, and the boot was worn off more on one side, which was unusual. She became weak, so that she fell frequently; thinks she was slightly dizzy before falling. The left leg gave no trouble, until, about six months before her entrance, the left foot troubled her. In November, 1875, she received a fright and fall. She left her situation on account of the weakness of her legs; and soon after, her hands began to trouble her, the right hand being first affected, and about six months later the left; they "curled up," and she began to drop things out of her right hand as early as December, 1875. About the same time she had numbness of the hands, as if they were "asleep"; the right hand being affected about six months earlier than the left. There has been no pain. Since November, 1875, when carrying moderately heavy weights she has fallen down much, but without loss of consciousness; she was only slightly dizzy. About three months before entrance she noticed a deformity of the thumbs and forefingers; this was owing to atrophy of the muscles. This grew worse; the "sleepy" feeling continued. It would seem that the weakness of the hands was noticed several months before the wasting. A little while before entrance she had cramps in the legs, the "ankles drew up," and there was cramp in the calves and in the peronei muscles; these cramps caused pain,

especially at night, and they have been growing worse, but they did not extend above the knee. There was also cramp in the flexors of the wrists, and sometimes the fore-arm was flexed on the arm; she had not noticed that the fingers were shut by these. About the time of entrance, and before taking bromide, the skin on the arms and legs became rough and scaly.

Now, there is a considerable interference with the motions of the arm, fore-arm and hand. The limit of motions at the shoulder-joint is rather restricted; supination of the fore-arm is limited by contraction of the pronators. The fingers can be slowly extended, but not to their full extent. In the right hand the motions are not quite so free as in the left. With the wrist extended and the hand prone, the fingers cannot be fully extended; but with the wrist on a line with the fore-arm, the fingers are extended feebly, and the first phalanx of the middle-finger is hyperextended. The last phalanx of the thumb is permanently flexed, and the thumb cannot be adducted. The hand is kept almost constantly nearly flexed, with the thumb flexed and strongly adducted. A slight degree of power is needed to extend the thumb and the fingers. There is evident contraction of the flexors. The motions of the left hand are a little more free; otherwise the condition is about the same. The thenar eminence and interossei on both sides are much atrophied. There is some trembling of the hands, especially or exclusively when in use, and at times, not continuously, the muscles of the hand have a fibrillary tremor. The faradic reaction of the muscles is very much diminished or lost in the extensors of the fore-arm, the interossei, the muscles of the thenar eminence, and some of the flexors, this change being greatest in those muscles which are weakest, and have suffered most from atrophy.

Her voice is rather coarse, and she says it has changed in character during her sickness. She also says that there is difficulty in swallowing; the food does not pass down readily, and sometimes it chokes her. There is no regurgitation through the nose.

The pathological processes in these three classes of cases are very nearly the same, but clinically there is a wide difference, and it is upon this difference that a division is based.

Cerebro-spinal sclerosis, when the antero-lateral columns alone are affected, usually begins insidiously; at first there is a loss of power or a trembling, or both, scarcely enough to attract the patient's attention. Generally one side is affected first, but soon the same is seen on the other side. There is usually no pain, no loss of sensation, no perverted sensation. Generally at this stage there are no other symptoms than the weakness and trembling, unless there may be slight cerebral symptoms, as dizziness, a sense of fulness or pressure, faintness, rarely headache. The trembling is peculiar; when perfect rest can be attained it ceases; but soon as an attempt is made to use a muscle the trembling begins again. An effort to carry a tumbler or a spoon to the mouth excites the trembling; as soon as the object is laid aside, and the hand is placed quietly on the knees, there is rest again. The head requires for its support in the sitting posture the action of the muscles of the neck; hence when affected there is a constant oscillation of the head, unless the patient lies down. When our patient, Wm. E., was sitting up the legs trembled but little; but when told to stand with his feet together and his eyes shut, soon the legs began to shake, and speedily the trembling increased to a remarkable degree. Excitement, a strong desire and effort to control the trembling, only increases it. In its peculiar features the trembling is very different from that accompanying paralysis agitans, as Charcot has pointed out, wherein the limbs are agitated when at rest, but when a motion is performed the trembling diminishes, and close fixed attention, instead of increasing, diminishes it.

As the disease progresses the agitation may become excessive, as in the second case above, and yet more in another case, wherein the agitation was so severe and violent as to shake the whole system with severe shocks when the least exertion was made, so that it was almost impossible to find a position, even lying down, in which there would not be

more or less agitation as one or another muscle was brought accidentally into action. As the disease advances, the voice changes; there is a short, sharp, distinct and separate pronunciation of each syllable, in fact a staccato movement. This was not noticeable in Case I.; it was observed in Case II., and was still more so in the extreme case mentioned above. Contraction of certain muscles interferes with motion; there is a continuous spasmodic rigidity, so that even passive motion is performed only with difficulty. There may be also attacks of spasmodic rigidity of the legs in extension, lasting only a short time, but repeated more or less frequently, — the so-called spinal epilepsy.

The weakness increases, and is one reason why the patient is unable to go about so much as formerly; walking soon tires the patient. The weakness may become so great as to be almost equal to a paralysis, only the least motion being possible; and when combined with contraction, walking is out of the question.

The eyesight may be affected; diplopia is not very common; amblyopia is more frequent. In the second case there was double vision for some time. Nystagmus is not uncommon; it was seen in Case II., but not until the later stage. Leyden says it is seen in about half the cases.

In uncomplicated sclerosis of the antero-lateral columns there is no loss of inco-ordination.

In the earlier stages the desired motion is properly executed, but with a tremulous motion; the tumbler can be grasped and carried to the mouth. In the later stages, when the muscular action is very much more irregular, there is more difficulty in executing any motions, and there may finally be a loss of co-ordination; but then there is reason to believe that the posterior columns are affected.

Sensation is not disturbed generally until the later stages of the disease, as in Case II.; yet even here there is reason to believe that the sensory disturbance is due to the extension of the disease beyond the antero-lateral columns. In the earlier stages there is no pain.

The trophic changes in joints, and the peculiar crises

found in sclerosis of the posterior columns are not met with otherwise.

The cerebral symptoms at first are comparatively slight, — dizziness, confusion, headache; they are not generally severe. Sometimes these are the first symptoms noticed, the spinal symptoms appearing later. Towards the close of life there may be serious impairment of the intellect, as in Case II.

The last stage, that just preceding death, presents to us a sad picture. The trembling which had perhaps been excessive diminishes in severity or ceases; emaciation is sometimes extreme; diarrhoea exhausts the patient; bed-sores form; there is entire helplessness, and the patient is lifted from bed to lounge or rocking-chair, and back again, a helpless weight, limbs trembling, countenance expressive only of gradually weakening mental power; the speech is much interfered with; words are jerked out, with such an apparent effort as to excite the compassion of the spectator; possibly deglutition is seriously impaired, saliva dribbling from the partially open mouth. Fortunately there is no pain.

Such has been the condition of two patients whom I saw in the last stages. Death does not always wait so long; not infrequently some intercurrent disease carries off the patient in an earlier stage.

The second class, to which Cases III. and IV. belong, offers very different phenomena to our consideration. In the patients just described the symptoms were so slowly and insidiously developed that they attracted merely a passing notice from the patient. In a few cases the same may be true of this second class; but generally the affection attracts the patient's attention very forcibly by the pain in the legs, which is frequently of a very severe type. This pain may be the only prominent symptom for years; then may follow numbness, and at length the patient may learn accidentally that he must use his eyes when walking, or he staggers. The pain is of a boring, throbbing, shooting character, suddenly darting through the leg or foot; the patient's expressions show that the torture caused thereby is

extreme ; the paroxysms last a few hours and are followed by a short intermission. So long does the pain exist as the only symptom that it is not uncommon to have patients and physicians describe it as rheumatic. In other cases the pain is less severe, or it may be entirely wanting. Various unnatural sensations may also be found, — tingling, formication, etc.

The anæsthesia may affect all kinds of sensation, or only one or two varieties ; it is found almost or quite universally in all cases of sclerosis of the posterior columns. In every case that I have seen I believe it has been present. It will sometimes be noticed before there is any pain. The delayed transmission of impressions noticed in Case IV. is not an uncommon phenomenon.

The motor disturbances are characteristic. The patient is unable to walk, even tolerably well, with his eyes shut, and is unable to stand with his feet together and eyes shut. In the earlier periods of the disease the disturbance of equilibrium is but slight ; as time advances, it becomes more marked, and, finally, it is utterly impossible for the patient to maintain his balance with his eyes shut. At first no change will be noticed in the gait when walking, but at length there is a marked peculiarity. The feet, when raised, are raised with a slight jerk, or are raised higher than is necessary or convenient ; when placed on the ground they are allowed to drop heavily, or are thrown forwards or sideways in a disorderly way. There is finally a perfect loss of the co-ordinating power. At length, as the disease progresses, the same loss of co-ordination is seen in the hands. Yet, with this disturbance of the motor function, so extreme perhaps as to prevent the patient's walking, there is not much loss of power. When in bed the legs can be moved in all directions with almost or quite their normal power. There is no trembling, as is seen in antero-lateral sclerosis.

Disturbances of vision are not uncommon ; these may occur in the earlier periods of the disease, and be of short duration, or there may be persistent amblyopia. Entire loss of sight is rare. I have seen extremely contracted pupils in advanced stages only of the disease.

There are generally no cerebral symptoms, excepting in those cases in which locomotor ataxia is combined with general paralysis.

The joints may be the seat of swelling and redness, and there are attacks which have been described as gastric and nephritic crises, which seem to be of the same nature as the pains in the legs.

It is not necessary to mention all the distinctive differences between the symptoms of these two affections. One usually begins in the arms; the other in the legs; one is without pain; the other is accompanied with severe pain; in one there is trembling, muscular weakness, no inco-ordination; in the other the reverse is noticed; in one slight or even severe cerebral symptoms occur; in the other, with one exception, they are wanting.

But sclerosis may not be confined strictly to the antero-lateral columns; the posterior columns also may become diseased, and then we may have a complicated case, in which will be found the symptoms of both classes of cases. It is rare, however, for posterior sclerosis to spread to the lateral columns, and even when it does thus spread, it is only to a limited degree, and not to an extent sufficient to give rise to the symptoms of antero-lateral sclerosis.

The gray substance may be affected, and the cells of the anterior cornua may undergo degeneration in both antero-lateral sclerosis and in locomotor ataxia. In the former the disease spreads directly to the gray substance; in the latter it follows the nerve-fibres which pass from the posterior roots to the anterior nerve-cells. When this change occurs there is, of course, muscular atrophy.

It is quite possible, then, to have a general mixing up of symptoms, as in our second case, in which, at first, the cerebral symptoms predominated; later there were those of cerebro-spinal sclerosis and locomotor ataxia.

The fifth case is the only one of its kind which has come under my observation. It seems to belong to that class of cases named by Charcot "amyotrophic lateral sclerosis"

(*sclérose latérale amyotrophique*). Charcot has collected twenty cases; five cases with autopsies were observed by himself. As this subdivision is comparatively a new one, I will give a rather full abstract of Charcot's lecture on this subject.*

The course of this affection is rather more rapid than that of progressive muscular atrophy, lasting only three years or so. During this time all the limbs may become atrophied and paralyzed; or only the arms are atrophied, the legs only being paralyzed. The disease begins generally in the arms, without fever and without any uncomfortable sensations, there is merely loss of power, gradually increasing and accompanied with some wasting, which affects the whole limb almost uniformly, but is not, in the earlier period of the disease, sufficient to account for the loss of power. The muscles affected with atrophy show fine fibrillary movements. Some muscles, being less affected than others, have a preponderating tonic traction and produce distortions; there is also spasmodic contraction of certain muscles, which gives rise much more to distortions. Charcot's description of the position of the arm and hand refers to cases rather more advanced than that of our patient; yet, in the present case, there is a striking resemblance to the position which he describes: "The arm clings to the side of the trunk, and the muscles of the shoulder resist any effect to raise it; the forearm is semi-flexed in pronation; supination and extension are not possible without some force and without giving rise to pain. The wrist is likewise semi-flexed, while the fingers are curled up into the palm of the hand."

While motion still remains possible, it is often accompanied with tremor similar to that seen in sclerosis in patches. A growth of fat sometimes hides the atrophy.

When the disease is advanced emaciation may be extreme, and the spasmodic rigidity may diminish. Sometimes the head is fixed by the rigidity of the cervical muscles.

After the arms the legs become weak, but do not suffer atrophy. After the disease has made considerable progress,

* Leçons sur les maladies du système nerveux. T. II., page 227 et seq.

the legs are attacked with spasmodic contraction, usually of the extensors, by which they are made rigid; and finally this rigidity becomes nearly or quite permanent.

Finally the phenomena of labio-glosso-laryngeal paralysis appear, with atrophy of the tongue.

The case of Annie F. resembles this affection, as described by Charcot, much more closely than any other disease. It differs in that the weakness was first noticed in the legs; the atrophy was later in appearing, and, being in a less advanced stage than the case described by Charcot, the symptoms are not yet so fully developed; yet even now the position of the hands is very similar to the drawing given by Charcot. Possibly there has been a growth of fat sufficient to conceal the atrophy.

It is evidently unnecessary to further consider the diagnosis of these three classes one from the other. Sclerosis in patches may, however, be mistaken for paralysis agitans, or sometimes, especially after the trembling has become excessive, for chorea. From paralysis agitans it may be distinguished by the fact that in this affection the trembling continues when the limbs are at rest, and when the attention is withdrawn from them, a muscular motion, especially if the attention is fixed on it, causes the trembling to diminish in severity, or to cease. This is the *chief* diagnostic difference given by Charcot. The pathology of paralysis agitans is, however, as yet very obscure. One case has been recently reported in which there was an annular sclerosis of the cord, only a thin ring of the circumference being affected.

The irregular motions in chorea are very different from those of sclerosis; in the former affection the jerking of the limbs occurs independently of any volition. In sclerosis it is not so; even when the limbs tremble so excessively that they are thrown about in a very irregular way, and most nearly resemble choraic movements, a muscular act must be attempted to call them forth, if only the act, almost involuntary, of maintaining equilibrium. The patient affected with sclerosis can accomplish the desired act; the choraic patient often cannot.

The pathological changes in locomotor ataxia are well known; at least their locality and general character are. The posterior columns of the cord are affected with sclerosis. But it is not true that the symptoms follow an affection of any portion of the posterior columns indifferently. It follows from the observations of Pierret that when the central wedge-shaped portions of these columns are alone affected, — the columns of Goll, as they are called, — there are no characteristic symptoms, so far as is known at present. It is only when the portion between this wedge-shaped portion and the posterior cornua is involved that the peculiar symptoms of ataxia are seen.

In sclerosis of the antero-lateral columns any part of these columns may be affected, and the disease is usually scattered about in patches, affecting one side here, the opposite side at another place, while at still another both sides are found diseased. But neither in this nor in locomotor ataxia is the change limited to the portions above mentioned. In ataxia the lateral columns also may be affected; in sclerosis in patches the posterior columns are frequently implicated. Under these circumstances, of course, there may be a diversity of symptoms, and in certain cases it may be impossible to accurately state to which class they belong.

In the third variety of cases Charcot, or one of his pupils, has found sclerosis of the lateral columns with destruction of the cells of the anterior cornua. E. Leyden is not yet prepared to accept this division; he considers some of the cases referred by Charcot to this class as cases of muscular atrophy or bulbar paralysis with secondary degeneration of the lateral columns. Other cases are to be included under general diffused chronic myelitis. The question whether a new subdivision of sclerosis should be made, in accordance with Charcot's opinion, must be considered as not yet decided.

The minute changes found in sclerosis of the white columns of the spinal cord may be included under three subdivisions: changes of the neuroglia, of the blood-vessels, and of the nerve-fibres. The nuclei of the connective tissue are much increased in number; the cells of the neuroglia are increased in size and frequently lose their granular appearance, and

their contents have a smooth appearance. The fibres of the neuroglia are increased in numbers immensely; the newly formed fibres are also finer, less thick and coarse than the normal fibres. As a consequence of this change in the connective tissue, the septa and trabecula of the white substance increase in thickness, the normal nerve-fibres decrease in number. The medullary sheath suffers first; this disappears and only the axis-cylinders remain, and finally these are destroyed. On fresh specimens a large number of granular corpuscles are found. These seem to arise in part from the destruction of the medullary sheaths, in part from changes in the walls of the blood-vessels.

That many of the axis-cylinders are destroyed at the same time with the destruction of the medullary sheaths is evident from the fact that in no section where the sclerosis has made even a slight progress is the number of axis-cylinders remaining equal to the number normally present in the cord. The spots of sclerosis seen with the naked eye, after the cord has been hardened by bichromate of potassa or chromic acid, show a well-defined, sharp outline; but under the microscope it will be seen that the transition from the healthy to the diseased cord is not abrupt, but the increased interstitial growth is pushed out in all directions following the natural septa, and by the gradual encroachment of this thickened tissue the nerve-fibres are surrounded and progressively destroyed; so that a group of apparently normal fibres, or even one such, may be seen in the midst of patches of sclerosis.

The walls of the blood-vessels are thickened, the external layers being most affected. The perivascular sheaths show a multiplication of nuclei; sometimes an exudation which hardens under the preservative fluid, surrounds the blood-vessel, and seems to have compressed it.

The process just described, rather too briefly, must be looked upon as an interstitial myelitis; the origin of the change is evidently in the neuroglia, and the results reached are very different from those found when the nerve-fibres are chiefly affected. A glance at the two processes would show how great is the difference.

Charcot considers the change in ataxia as different from that found in sclerosis, in that in ataxia the axis-cylinders are not found in the midst of the increased connective tissue. I am not yet convinced that there is sufficient difference in this respect to justify us in looking upon the two processes as distinct one from the other.

The above account of the changes is a brief summary of the changes found in Case II. When the gray substance is also affected the nerve-cells undergo degeneration, lose their processes, shrivel up, are reduced in size, and finally disappear; the nerve-fibres, which run through the gray substance, are also lost. This change, however, is rare, and has been found in only a few cases. In Case II. the gray substance was in several places partially or entirely surrounded by the spot of sclerosis, and to the naked eye they seemed mingled together; yet, under the microscope, the nerve-cells were seen to be nearly or quite normal, and comparatively few or no granular corpuscles were found in the gray substance; they came close up to its border, and every nerve-fibre in the white columns at the edge of the anterior cornu was destroyed; but only where a few of the affected fibres seemed to turn into the gray substance, or around the blood-vessels, were there to be seen any granular corpuscles.

The foregoing is a mere sketch of the changes seen under the microscope in a patch of sclerosis. To have gone more extensively into a description of the pathological histology of this form of myelitis would have required too much space, and would have involved a discussion of many questions comparatively unimportant, or which have not yet been definitively decided by observers.

Very little can be said with regard to treatment. Electricity may be of benefit if the disease has not progressed too far. In nearly all, if not in all, cases, patients have expressed themselves as feeling better, able to walk more steadily in ataxia, or the trembling was less in sclerosis. The greatest relief has been obtained in sclerosis, diminish-

ing the trembling; this has been evident to the friends as well as to the patient. I have never had a case of recovery, though such a result has been reported by others. One case, which seemed to me at first to be ataxia, recovered; but I am rather inclined to believe it was a case of rheumatic or gouty anæsthesia of the joints, with partial loss of muscular sense.

Nitrate of silver has relieved some of the symptoms in ataxia, especially the pains; and in so far was of great value.

Iodide of potassium and cod-liver oil have been highly recommended. Leyden, as well as other authors, also strongly advises baths, hot or cold, according to the patient's condition.

When the disease has made comparatively little progress, if it has advanced but little beyond the earlier stages, all remedies are unavailing; the most that can be done is to relieve the patient's unfortunate condition.

COLD-WATER TREATMENT OF TYPHOID FEVER.

BY ROBERT T. EDES, M. D.

The cold-water treatment of typhoid fever has been carried out at this hospital, if not very extensively, yet sufficiently to warrant its mention, especially as the results obtained are believed to be of a favorable character, and to warrant the introduction of the method into the therapeutics of this disease, as a highly important addition to our resources.

Theoretical considerations, though interesting, are here hardly appropriate, especially as so much remains to be determined; but the number of cases, though not very great, is large enough to make our experience of some value.

Cold bathing in typhoid is no new thing, having been proposed and used as a remedy in the latter part of the last century by Jackson and Currie,* and with considerable reputation; soon, however, falling into neglect, possibly for the same reasons which will oppose its spread at the present time.

Various methods of applying cold externally in typhoid fever have been used, but of these some demand no more than a mere mention. The cold affusion, cold shower-bath, or a plunge into the sea, are not likely to find general acceptance, and observations as to their effects will be rare.

We have really to consider four:—

1. Cold sponging, more or less frequently repeated, is the easiest, but the least effectual in withdrawal of heat,

* Medical Reports on the Effects of Water, cold and warm, as a Remedy in Fever and other Diseases. Philadelphia: 1808. (From fourth London Edition.)

and it is chiefly of use when other means cannot be employed. Its soothing influence upon the dry and burning skin is, however, of no small advantage.

2. The cold pack is a method which may be of use in private practice, if the others are objected to. Two or three renewals of the wet sheets are necessary, however, to equal in effect a full bath. It has been suggested that the sheets may be repeatedly sprinkled with cold water, and of course, if this is frequently and thoroughly done, the method approximates more or less a full bath.

3. The simple full cold bath by immersion is the method which has been most employed, and which is perhaps the most efficient, demanding a less expenditure of time, labor and water. Against this method is chiefly to be urged its apparent harshness.

4. The fourth plan is the one which seems to me to combine greater advantages than any other, although it is, to be sure, the only one of which I have personal experience, unless the first be excepted. It is that which, with the exception of the first, has been exclusively employed in this hospital.

The patient is placed in a bath near the temperature of the body, 100° for instance; then warm water is drawn off and cold added until a limit of between seventy and eighty degrees or less is reached. Two or three feet of Indian-rubber hose slipped upon the cold-water faucet is convenient in cooling the bath equally, and avoiding the splash and noise of the running water. The patient's limbs should be rubbed by attendants to equalize as far as possible the circulation, and thus promote the cooling from a larger surface. After ten or fifteen or more minutes he may begin to shiver, and he should then be placed in bed and covered up. If the chill be severe, heaters may be placed to the feet, the amount of heat thus added at a distance from the trunk being small, while it greatly relieves the subjective sensations of chill. A glass of wine may also be administered, especially if, as sometimes happens, the pulse becomes small. The effect of the wine is to excite the heart and dilate the arterioles of the surface, thus promoting the transfer of heat from the interior

to the exterior. Its physiological action seems to be peculiarly adapted to this stage of the treatment, and, indeed, I am not sure that it would not be better to make its use the rule rather than the exception.

The disadvantages of this form are the necessary time, labor and water, disadvantages which, of course, must vary greatly in weight according to the circumstances of the special case. It is also somewhat, though not materially, less efficient than the full cold bath, and if long-continued its effects are possibly of longer duration. In its favor are its great apparent mildness, and, possibly, a less tendency to re-action and over-formation of heat.

How often and when should baths be given? The German authors answer this question very simply by saying, Whenever the temperature, which should be measured at least as often as every two or three hours, reaches a certain point. This point is fixed by Liebermeister at 102° if taken in the axilla, or 103° in the rectum; by Ziemssen* at 104° in the rectum during the first two weeks of the fever, later, at a somewhat lower point.

Such frequent measurements, and especially carrying on the bathing through the night, demand an amount of skilled labor which has not been at my command, and my habit has been, upon observing the temperature of the day before, and the condition of the patient at the morning visit, to order the baths for the day, usually specifying approximately the hours.

Ziemssen states that when gradually cooled baths are used, and one is given whenever the temperature reaches 104° , at first, usually four or five, or at the most six, baths are necessary in the twenty-four hours, and that these usually fall between the hours of one and two, six and eight, and ten and eleven in the forenoon, one and two, four and six, and eight and nine in the evening. When less than six are given, that between eight and nine is first omitted, and then one in regular succession from the beginning. Four baths per diem I have often given, but never, I think, six.

* Ziemssen and Immermann. Die Kaltwasser Behandlung des Typhus abdominalis. Leipzig: 1870.

With four, I have usually two in the afternoon, to anticipate the evening rise of temperature, and one as late in the evening as is compatible with the arrangements for night-watchmen, etc., in order to have the effect last as far into the night as possible. A bath in the evening often helps materially in procuring a good night's rest. I admit that this is only an imperfect carrying out of the system, but the circumstances I have alluded to rather than my own wishes are responsible therefor.

Since the improved arrangements and discipline of the hospital have removed this objection, my term of service having changed to the spring months, the cases of typhoid in my service have been comparatively few.

Let us consider what practical experience says of the advantages of the cold-water method, and what it can or cannot do. I now speak of the more efficient methods, that is, the cold or gradually cooled full bath, and most distinctly do not mean in the least tepid or cold sponging, although we may be obliged to use it as an inefficient substitute. In using statistics I am fully aware how erroneous may be their teaching, from the varying intensity of different epidemics, the class of population from which the patients are drawn, the time at which they seek assistance, the treatment other than medical, the hygienic surroundings, and the varying diagnosis. But sufficiently large numbers may now be obtained to eliminate some of these sources of error, and among them series of cases from the same hospitals, where two different methods have been practised.

As there may be those who will attribute a decreased mortality under cold water rather to a disuse of other treatment than to a use of the baths, and will intimate that the patients get well, not because they are *bathed*, but because they are *not drugged*, we ought to take as our standard of comparison series of cases which have received but little active treatment, and inquire whether this method produces any favorable change in the natural course of the disease. Unfortunately the large number of cases assembled by Murchison cannot be taken as representing a purely expectant treatment, but merely an average of all treatments into which

we may suppose the expectant entered pretty largely. The more modern the statistics, the fewer disturbing elements, we may suppose, will affect the natural course of the disease. This abstinence from active medication is probably on the whole a gain, but it by no means follows that all plans of treatment must have been harmful, nor does it follow that a pure expectancy is the safest treatment.

It is to be remembered that none of the modern promoters claim for cold bathing any power to cut short the typical and, so to speak, normal course of the disease, nor to rob it of many of its essential features. The fever, that is, the abnormally high temperature, is the only symptom directly affected thereby; but as a secondary consequence of this we have, as is claimed, slower pulse and stronger heart, less nervous disturbance, less delirium, less diarrhoea, fewer bed-sores, and a more rapid convalescence. In this way the length of the sickness may be shortened, though the "run of the fever" is not, and the favorable results become most evident in a lighter form of disease and a decreased rate of mortality. We do not so much expect wonderful recoveries in very severe cases, as we do large numbers of cases which, if this treatment be early adopted, do not become severe at all, and do not develop in the highest degree the most dangerous symptoms of the disease.

An average rate of mortality from typhoid might be stated which would be accurate within quite narrow limits; but the value of such a statement for our purpose would be less than that of statistics giving more fully the methods of treatment.

In the eighteen thousand cases tabulated by Murchison* the average mortality was eighteen and sixty-two hundredths per cent.; but the separate groups of cases which went to make up this large number varied from sixteen to thirty-two per cent. Chambers gives one hundred and twenty-one cases, with a mortality of only two and a half per cent.; three hundred and three cases from the Massachusetts General Hospital give a mortality of about thirteen per cent.; Dr. Upham's one hundred and fifty-two from the City Hos-

* Figures in this paragraph not otherwise credited are from Flint's Practice of Medicine.

pital* about fourteen per cent.; Dr. Flint's seventy-three cases, about twenty-four per cent. In two sets of cases at Bellevue Hospital, quoted by Dr. Flint, in which the treatment was chiefly by stimulants, except that in one series dilute sulphuric acid was administered, the rates were respectively twenty and ten per cent.

M. Bordier† represents the average mortality in the hospitals of Paris, under the ordinary methods of treatment, as from five to nine per cent.; but in the one hundred and forty-seven Parisian cases included in Murchison's collection it was thirty-two per cent.

Now, as to the results from cold bathing: Jürgensen‡ reports from the same hospital at Kiel a reduction of mortality from fifteen to three per cent.; Liebermeister from sixteen to nine per cent.; Ziemssen and Immermann from thirty to nine per cent. Brand reports fourteen hundred and eleven cases with a mortality of four per cent., and one series of one hundred and seventy with no mortality at all.§ Lissauer|| observed in three army hospitals a mortality of twenty-four per cent. under expectant treatment, six by cold water. His numbers are, however, small.

M. Bordier, in criticising these with some other statistics, says that the wonder is, not so much why patients have done so well with the baths, but why they did so badly before, and endeavors to show from his table (which is a very complete one) that the average results claimed by the advocates of cold baths are really no better than those obtained by others who do not use them; but in his own tables, the total calculation of which is of no great value, since the number of cases upon which the percentages are computed is not given, we find the groups where the mortality is zero upon the cold-water side only, and of these there are six, not including Brand's, which I have just mentioned.

Giving due weight to the fact that many physicians who

* Medical and Surgical Reports. Boston City Hospital. First Series.

† Journal de Thérapeutique; 1874, page 465, *et seq.*

‡ Klinische studien über die Behandlung des Abdominal typhus mittelst des Kaltenwassers. Leipzig, 1866.

§ Ziemssen and Immermann. Op. cit.

|| Centralblatt für die medicinische Wissenschaften; 1872, page 47.

have published tabular statements on this subject are ardent advocates of this treatment, it certainly seems as if the comparison of series of cases in the same hospital were as little open to objection as any method of using statistics. It would be easy to collect many more groups of this character, even from the table of M. Bordier himself, but as there are but few statistics directed to this point which give a different result, I may refer at once to these exceptions.

Two series of cases are reported from Duchek's clinic at Vienna, where the cold-water treatment gave a mortality of twenty-eight per cent. as against twenty-seven per cent. without such treatment.* The percentages are too high and the difference too small for us not to suspect that something more than either baths, or the omission of them, must have been responsible for this great mortality of more than one death in four patients..

Four other series give in typhoid fifteen per cent. for bathing as against twenty-eight for expectancy; but in typhus the results were against the cold water by twenty-six to eighteen.†

As to my own experience in this hospital, the numbers I can present, although too small to have much value alone, have a certain amount of weight in connection with those I have quoted. The plan also has, for reasons above stated, not been carried out so thoroughly as might have been wished.

The figures, however, taken without explanation, furnish no very strong argument in favor of the conclusions I draw.

Taking the cases of typhoid fever which have been under my care in the City Hospital during the three years 1872 to 1874, except a few which entered convalescent, or nearly so, or in which the result may be considered to have been practically decided before they fell into my hands, I reckon sixty-six in all, from which a stricter scrutiny might throw out more than one. These will not absolutely correspond with the diagnoses made in the indices to the hospital books, where typhoid fever covers many cases entering in the

* Centralblatt für die medicinische Wissenschaften; 1871, page 336.

† Centralblatt für die medicinische Wissenschaften; 1872, page 333.

typhoid condition, where the interest and affection of friends are not sufficiently great to induce them to furnish any information as to previous symptoms, but become strongly developed when an autopsy is asked for. In these sixty-six cases, most of which were treated, when required, by more or less bathing, eleven were fatal, the death-rate thus being about eighteen per cent.

It is evident, however, that the results of a treatment which aims to control symptoms by mitigating the general violence of the disease will be better shown where it is pursued from an early period than in a promiscuous collection of cases subjected to it at all stages of progress; and consequently a series from the first week of the disease is a fairer test than the average of all. In the table of typhoid fever at the City Hospital, given by Dr. Upham,* I find forty-six cases entering in the first week of the fever, with five deaths, or a little over ten per cent. Of my own, as I have classified them, I have in the three years (1872-74) thirty-four such cases, with a mortality of three; but if the beginning of the disease is reckoned, as Dr. Upham has done in his table, that is, from the occurrence of certain severe symptoms, and not from taking to the bed, one case and one death would be counted out, giving a mortality of about six per cent. But of the two remaining deaths one was of a child, where there were no clearly diagnostic symptoms of typhoid, fever and abdominal tenderness being alone noted, and the absence of diarrhœa specially mentioned; no autopsy was made. The remaining case presented an unusual intensity and character of nervous symptoms, and the fatal result was due to sloughing and perforation in the sigmoid flexure of the large intestine. I think, therefore, I am fully justified in stating that of thirty-two patients in three different years, *where a clear diagnosis of typhoid fever in the first week is admissible*, only one died.

Some of the objections to this treatment deserve mention. A repugnance to the baths on the part of the patients, rather, however, to the chilly sensations than to the fatigue, might

* Medical and Surgical Reports. Boston City Hospital. First Series.

naturally be expected, and frequently exists at first; but in the great majority of cases they were either found after a time less disagreeable, or the relief experienced was so decided that they were borne without trouble, or even anticipated with pleasure.

In a few, however, the repugnance could not be overcome, and the treatment was reluctantly abandoned. As it happens, one of the non-fatal cases which remained longest in the hospital was one of this kind; and in another, in 1875, which proved fatal, it was found impossible, without great apparent cruelty, to continue the baths.

The liability to intestinal hemorrhage, which is said by the German writers to be a distinct and formal contraindication to this method, or at any rate to its full vigor, was but little marked with us, there having been no serious case thereof among the sixty-six.

The increased labor involved in frequent bathing, which is certainly not trifling when the number of patients is considerable, provoked much less complaint from the attendants than I expected. It may be in a measure compensated by the less frequent occurrence of involuntary dejections, and the consequent renewal of bedding, and the lessened liability to bedsores. While the patient is in the bath an opportunity is offered of re-arranging and ventilating the bed.

It may be remarked, in conclusion, that our later statistics of mortality from typhoid under the cold-water treatment are brought into contrast, not as in some of the German series, with an enormous death-rate, and, as we can hardly help inferring, an exceedingly unfavorable hygienic condition of their hospitals, but with numbers of cases treated in well-ventilated rooms, with careful nursing, and treatment but little disturbing, a test which is, up to the present time at least, one of the severest.

The treatment after the bathing has been, in the main, that pursued heretofore in this hospital, and generally in this community. Rest, good ventilation, — which, in the new wards, we hope will be still better, — as much liquid food (chiefly milk) as the patient will take, and alcohol frequently, especially toward the latter part of the disease.

In a few cases large doses of quinia (twenty to thirty grains) were given, with the object of reducing the temperature. This drug assists greatly the antipyretic action of the baths, and renders a smaller number *per diem* necessary, as its cooling action is manifest over twenty-four hours or more.

SURGICAL ABSTRACT.

BY DAVID W. CHEEVER, M. D.

I. OPERATIONS ON THE LARGER BLOOD-VESSELS.

CASE I. — *Wound of the Femoral Artery; Ligature of the External Iliac; subsequent Amputation; Recovery.* — On February 28th, 1872, T. S., a healthy boy, of 16 years, had a quarrel with a companion on board the school-ship. Shortly after, as the boys were sitting side by side, his adversary, in rising, struck the patient a back-handed blow with a knife. The wound was a narrow, punctured one, in the left groin, just below Poupart's ligment. Its direction was downwards and inwards. Profuse hemorrhage immediately came on. The officers of the ship twisted a rope around the groin, and partially arrested the bleeding. Meanwhile physicians arrived, and finally stopped the flow of blood by a large pad, compress, and tight, spica bandage over the wound. These were temporary measures, and the only ones that could be employed at the moment. The patient's condition was one of alarming syncope; and, at one time, the radial pulse ceased. He slowly rallied, after the bleeding was stopped, and was then carefully transported to the City Hospital, where he arrived safely, and without further hemorrhage. The bleeding being under control, it was thought best to await the progress of events. He was confined to bed, and a special watch set over him. Matters went on quietly for forty-eight hours. He ate a good deal, slept, and recovered animation and strength. In the afternoon of March 2d, as the patient was raising his back for the bed-pan, hemorrhage came on. The assistant immedi-

ately arrested it by pressure with the hand; and the house-surgeon, arriving, cut off the bandage, applied a new compress, and secured the bleeding by a tourniquet and roller-pad directly over the wound. Not more than two ounces of blood were lost.

Dr. Cheever was then sent for, and at seven, P.M., had the patient etherized, in order to attempt more permanent measures to arrest the hemorrhage. On removing the tourniquet and compress, the color, force and quantity of the blood poured out did not leave much doubt that we had to deal with a wound of the femoral artery. It was found that the bleeding came very nearly from under Poupart's ligament. Bleeding could be controlled by pressure of the fingers in the wound, aided also by pressure over the bone above; the wound was enlarged, and attempts made to secure the bleeding vessel in the wound. Repeated gushes of blood, however, foiled these efforts; and, as the patient was again becoming very feeble, it was deemed more prudent to secure the main trunk above. The tourniquet and roller-pad were again applied to the wound, and the bleeding wholly checked.

An incision was made above Poupart's ligament, curving upwards and outwards towards the spine of the ilium. The muscles and transversalis fascia were cautiously traversed; the peritoneum was pushed back, and the external iliac artery tied with a silk ligature. It was now considered wisest to guard against recurrent hemorrhage by tying the vessel in the wound. By a little dissection it was demonstrated that the femoral artery was about half cut through on its posterior wall, just below Poupart's ligament. A ligature was applied here, and both wounds were united by silk sutures. The patient rallied well, and bleeding did not recur. From first to last there was no peritoneal inflammation.

March 3d. — There was no hemorrhage. The patient complained of pain in the left foot. The temperature of the legs was alike.

March 4th. — Great pain in the leg and foot was complained of; it was relieved by morphia. The patient was feeble. Pulse, 150. He was fed on milk-punch. Tem-

perature of right leg, 101° ; of left leg, 92° . The distal phalanges of the toes of the left foot were livid; sensation was diminished there. The left leg and foot were enveloped in cotton batting.

March 5th. — The general condition was better. Pulse, 108. The wounds looked healthy; less pain was complained of. Temperature, right leg, 100° ; left leg, 92° ; one-half the left foot was blue.

March 6th. — There was more pain in the leg. Temperature of left ham, $97\frac{1}{2}^{\circ}$. The entire left foot was mottled with livid lines.

March 9th. — Temperature of *both* popliteal spaces, $100\frac{1}{2}^{\circ}$. Pulse, 120. The pain was less.

March 13th. — A line of demarcation was now formed half way between the ankle and the knee. The foot and leg were in a condition of moist gangrene, and quite offensive. The limb was imbedded in powdered charcoal.

March 24th. — The general condition was improving. The ligature came away from the iliac artery (twenty-second day). The wound doing well. The soft tissues of the leg had sloughed quite through.

March 29th. — The condition was good. Spontaneous amputation had occurred down to the tibia and fibula. The patient was etherized; masses of granulations were pushed back; the bones were denuded higher up by scraping back the periosteum, and the bones were sawed off. There was moderate hemorrhage.

May 10th. — The amputation has not resulted well. The bones are exposed; the stump is painful, and a raw, granulating surface extends up beneath the calf to the ham. The patient has three bedsores. The wound in the abdomen is still open.

May 13th. — The limb was amputated above the knee by Dr. Ingalls.

May 18th. — Stump doing well.

May 22d. — Extension was applied to draw down the flaps, which tend to retract.

May 25th. — The patient is doing better.

June 23d. — There is an exfoliation of bone.

July 12th. — The periosteum was scraped back, two and a half inches of necrosed bone were sawed off, the cicatrix was cut out, and the edges of the stump brought together.

July 20th. — The stump is doing admirably.

July 30th. — The wounds are all healed. The patient was discharged, well.

It would appear that the vitality of the limb was so impaired by the ligature of the iliac artery that nature could not cover in her spontaneous amputation as she often does after frost-bite; nor could she repair an amputation of the thigh even, without necrosis and shortening.

CASE II. — *Aneurism of the External Iliac and Femoral Arteries; Ligature of the External Iliac; Death from Exhaustion and Embolism.* — The patient, a man of 25 years, and of rather dull intellect, had a spontaneous aneurism in the right groin, extending some two inches below Poupart's ligament, and equally above into the abdomen and towards the median line. No very precise history of its duration could be obtained.

April 5th. — Dr. Thorndike tied the right external iliac artery in the usual way. Pulsation ceased in the aneurism.

April 7th. — The temperature of the right popliteal space was 97° ; that of left, was 96.5° .* Immediately thereafter the temperature of the right limb began to fall, and later to rise, as seen in the accompanying table: —

Date.	Temperature of right foot.
April 9th	92°
“ 10th	93°
“ 12th	92°
“ 14th	93°
“ 16th	93°
“ 17th	94°
“ 18th	96.5°

* This temporary rise in the temperature on the affected side, after ligature of a main trunk, we have noticed repeatedly. The subject was alluded to in the First Volume of the Reports of the City Hospital.

April 19th (fourteenth day). — The patient says he *feels* his right foot.

April 20th. — Diarrhœa and exhaustion are increasing.

April 21st. — A slough has formed over the sacrum.

April 22d. — A slough is forming on the *left* heel (the sound side).

April 27th. — The patient is becoming very stupid.

April 28th. — The patient had a chill, and is more comatose.

April 30th. — He died.

The autopsy revealed a clot in the longitudinal sinus of the dura mater. The ligature was lying loose in the wound, and the external iliac artery was cut through. The aneurismal sac was filled with coagula.

CASE III. — *Traumatic Gluteal Aneurism; Ligature of the Gluteal Artery; Recovery.* — The patient was a man about 30 years of age. On Christmas Day, 1873, he became engaged in a quarrel, in the course of which he was stabbed in the left buttock, the left thigh being flexed upon the abdomen at the time of the injury. The wound was at once followed by copious hemorrhage. The bleeding was controlled, but the weakness resulting from the loss of blood forced the patient to his bed. Presently intense pain developed in the injured region, and shot down the sciatic nerve; and when Dr. Thorndike first saw the patient, at the end of ten days after the injury, the continued use of morphia was necessary to afford any degree of comfort, day or night.

On examination of the part, Dr. Thorndike found the wound quite healed, Just behind the great trochanter, and over the sacro-ischiatic foramen was a pulsating tumor, of the size of a goose-egg; its outline was irregular. On auscultation, a distinct bruit was evident. There was great tenderness on pressure, and the pain was excessive. In the two weeks' interval since this first examination, the symptoms had increased in severity, and now demanded surgical interference for their relief.

Dr. Thorndike adopted the older method of operating in preference to the Hunterian operation. To control the

hemorrhage, Skey's abdominal tourniquet was applied, but, though carefully adjusted upon the aorta, it failed to compress effectually, and the bleeding was prevented by digital pressure on the artery, against the pelvic edge, in the wound. To expose the tumor, two incisions were made: one, eight inches long, starting two inches below and just behind the great trochanter, and extending obliquely upward and backward toward the sacrum; the other, four inches long, extending from the middle of the former, upward, toward the crest of the ilium. The tissues were divided down upon the coagulum, and the incision into this mass was immediately followed by a gush of clotted blood and by a fresh arterial flow from the injured vessel. Not without difficulty, a ligature was passed, by means of an aneurism-needle, around the vessel on the proximal side of the wound and then on the distal side. Examination showed that the knife producing the injury had penetrated the gluteal artery just as the vessel entered the sacro-ischiatic foramen to leave the pelvis.

Pulsation and pain entirely ceased. The wound suppurated kindly. The ligature came away on the eighteenth day. The patient progressed without any unfavorable symptoms, and at the end of seven weeks he was discharged, well.

CASE IV. — *Traumatic Aneurism of the Femoral Artery; Rupture of the Sac; Ligature of the Artery in the Sac; Recurrent Hemorrhage; Ligature of the Femoral in Scarpa's Triangle; Pyæmia; Death.* — The patient was a young man, 20 years old. Fourteen weeks before entering the hospital he received a pistol-shot wound in the left thigh, the ball entering on the outer and posterior aspect of the middle third, and passing obliquely downward, inward and forward, to emerge four inches above the knee. Two days after the injury the thigh swelled to twice its usual size; but the swelling subsided under the influence of rest.

When the patient entered the hospital the thigh was one-third larger than its fellow. During the week following his admission the swelling and attendant pain had increased; there was a symmetrical tumor on the inside of the thigh, in

the middle third, with an oval outline and obscure fluctuation. Careful examination revealed no bruit, thrill or murmur in the tumor. The temperature of the two limbs remained the same.

To determine the hitherto undecided diagnosis, the tumor was punctured with Dieulafoy's aspirator needle. A small quantity of thin, bloody fluid followed the puncture. The swelling was now freely laid open by an incision eight inches long, the hemorrhage being controlled by an elastic tourniquet. The incision exposed a great mass of coagulum; this being turned out of the wound, there was found lying on the femoral artery, just as it entered Hunter's canal to pass from the front to the back of the thigh, a ruptured aneurismal sac, displaying well-defined layers. This being removed, the wall of the artery was found open on its lower and inner aspect, the opening being a third of an inch long and a sixteenth of an inch broad. The artery having been separated from its sheath, a ligature was applied on each side of the aneurismal opening.

The sequence of symptoms was now made quite plain. The bullet grazed, without rupturing, the artery. This was followed, in two days, by sloughing of the arterial wall and the formation of an aneurism. The aneurismal sac, in turn, gave way, in consequence, possibly, of some over-exertion, and a diffused aneurism resulted.

During the ten days following the operation no unfavorable symptoms were manifested. Then secondary hemorrhage from the femoral artery occurred. Dr. Thorndike tied the vessel above the former point of ligation, securing it at the apex of Scarpa's triangle. There was no recurrence of the bleeding. The patient re-acted well, and, during the next week, progressed toward recovery; he awoke one morning, however, to find himself blind. The pulse at this time was quite as it should be normally; there was no bleeding or paralysis. The pupils were contracted. Coma soon followed. On the second day of this condition there were rigors, with increasing stupor, but without paralysis. During the next three days the symptoms remained nearly constant, with a steady tendency to sinking. Death oc-

curred on the fifth day after the first symptom — blindness — was noticed.

At the autopsy there were found the purulent *dépôts* of pyæmia in the lungs, the mesentery, the kidney and the spleen; there were none in the liver. There was no clot in the femoral artery. In the brain there was an abscess in the right crus cerebri and one also in the cerebellum. Pus and lymph appeared between the cerebellum and the medulla.

Stupor, similar to narcotism, with *contracted* pupils, has been noted by some authorities as associated with abscess in the cerebellum.

CASE V. — *Rupture of the Popliteal Artery with Diffused Aneurism; Amputation; Death.* — About two hours before being brought to the hospital, a middle-aged man was kicked on the right leg by a mule. The skin was not broken, and there were only two or three slight abrasions over the anterior surface of the tibia. There was a large swelling in the right popliteal space, extending down to the calf of the leg. The measurements around the knee and calf were respectively three and two inches larger than those of the corresponding parts of the left leg. The skin over this tumor was full, tense, and livid. No pulsation could be felt in either the anterior or posterior tibial arteries, and the limb was colder than its fellow. The ligaments about the knee-joints were so extensively lacerated that the head of the tibia very readily fell back into the popliteal space. The patient was in fair condition, although he was said to have been partially intoxicated at the time of the accident.

The enormous effusion which had taken place in the short space of two hours, together with the ecchymoses, and the sacculated, fluctuating feeling of the ham, rendered it evident that a large extravasation of blood must be present. Whether this had come from the rupture of the popliteal vein, or artery, Dr. Cheever felt unable to determine, since the absence of pulse in the tibial vessels might be due either to the pressure under the fascia of a large effusion from the vein, or to a break in the main artery itself. The thinner

wall of the great vein would seem to render that vessel more likely to be torn than the artery.

Traumatic aneurism of such magnitude requiring immediate interference to check the bleeding, the patient was etherized, and a three-inch vertical cut made over the centre of the ham. A rush of blood and clots immediately followed, and on sweeping this out with the hand, the whole popliteal space was found lacerated, with the outer head of the gastrocnemius torn away, the entire expansion of the semi-membranosus fascia, which lines the back of the articulation, ruptured, and the knee-joint gaping open. It being evident that death would result from delay, Dr. Cheever immediately amputated the thigh at the middle third by the circular method. The arteries were tied and the wound closed with sutures. An examination of the amputated leg showed the following lesions: The popliteal artery was torn completely across, opposite the head of the tibia, and the ends had retracted two inches; the vein and nerve were uninjured; the crucial ligaments were separated from the tibia; the posterior ligaments were completely divided, and the lateral partially; the semi-lunar cartilages were dislocated, and a small piece of bone was chipped from the head of the tibia; the outer head of the gastrocnemius was torn from the femur; all the tissues in the ham, down to the calf, were severely bruised and lacerated, and infiltrated with blood.

The patient did well for a week. He then had rigors and colliquative sweats, and died of pyæmia on the twelfth day.

The *Common Carotid* artery was tied by Dr. Homans, for secondary hemorrhage in a deep abscess of the neck. The bleeding came from the bottom of the abscess, and could not be controlled without tying the main trunk. The hemorrhage did not recur. The ligature came away the twenty-first day. The wound closed, and the patient recovered without paralysis.

The *Common Carotid* artery was tied by Dr. Cheever, for hemorrhage within the throat from a cancer of the tonsil. The hemorrhage ceased and never recurred. The operation

was on December 11th. The wound did well. There was no loss of sensation or motion.

Dec. 21st. — The patient was able to be about. Enlargement of the liver, with ascites, supervened, and he died January 5th.

No clot was found in the carotid. The period of life after the operation was too short to test whether the tying of the main artery had checked the growth of the cancer of the tonsil.

The *Brachial* artery was tied by Dr. Cheever, in a boy of 15 years, for a wound of the palmar arch. There had been repeated hemorrhages, and the hand was in so bad a condition that it was not thought wise to attempt ligature there. Pulsation returned in the Radial in forty-eight hours. The ligature came away in thirteen days; and on the eighteenth day he was discharged, well.

The *Brachial* artery was tied by Dr. Cheever, in a boy of 18 years, for a severe cut of the upper arm, severing some of the muscles, the artery, the ulnar nerve, and a vein. On the sixth day the ligature separated prematurely, with a profuse hemorrhage. The arm was amputated by Dr. Gay. The patient died the following day, and the autopsy revealed excessive bloodlessness of all the viscera.

The *Ulnar* artery was tied three times for hemorrhage. The ligatures separated on the sixth, seventh, and ninth days, respectively. All the cases did well.

The *Radial* and *Ulnar* arteries were tied simultaneously for a wound of the palmar arch, where pressure had failed. Entire success followed.

The *Radial* artery was tied for an aneurism in the anatomical *tabatière*, but pulsation continued. The *Ulnar* artery was now tied, and pulsation ceased. Recovery followed.

The *Dorsalis pedis* was tied once ; and there were numerous ligatures of veins.

II. EXCISIONS OF JOINTS.

Since the publication of the first Report there have been *twenty-two* excisions of joints ; of these there were *ten* of the hip, *six* of the elbow, *three* of the shoulder, *one* of the knee, *one* of the ankle, and *one* of the tarsus.

Excisions of the Hip. — (1) Julia H., aged 22. Disease of hip for five years. She remained all winter under treatment without benefit, and was excised by Dr. Thorndike. She suffered from shock, vomiting, and repeated rigors, and died in one week.

(2) J. McD., aged 12. Hip-disease for a long while. Excised, by Dr. Thaxter, July 22d ; died, August 7th, of exhaustion.

(3) Charles M., aged 5. Hip-disease, following injury fourteen months before entrance. Excised, by Dr. Thorndike, March 22d. Discharged, much relieved, June 28th of the same year.

(4) Wm. M., aged 8. Hip-disease two years, with sinus. Excised, by Dr. Thorndike, March 14th. Discharged, much relieved, after three months and a half.

(5) Eliza F., six years old. Elbow excised, by Dr. Thorndike, three years ago, for injury ; the patient now has a useful arm. She has had hip-disease for fifteen months, abscess and sinus. Hip excised by Dr. Homans ; the patient sank from exhaustion, and died in ten days.

(6) H. B., 7 years old. Hip-disease one year. Excised by Dr. Cheever. Died of exhaustion, in three months.

(7) M. F. H., aged 37. Hip-disease when five years old. Spontaneous cure with dislocation at fourteen years. The disease reappeared after a fall, three years ago. The patient had been confined to bed for eighteen months before entrance to hospital with abscesses and great pain. Hip excised, by Dr. Cheever, with great relief. Recovered.

(8) H., aged 6. Hip-disease of four months; has sinus. Hip excised, by Dr. Cheever. Died in sixteen days, of exhaustion.

(9) B. F. D., aged 10. Hip-disease for several months. Hip excised, July 7th, by Dr. Ingalls; carious trochanter gouged November 20th. April 2d, discharged, well. Sinuses closed; patient runs about nimbly.

(10) P. McG., aged 13. Hip-disease, following injury. Hip excised, by Dr. Thorndike, January 29th. July following, patient still in hospital, but doing well.

Excisions of the Elbow. — (1) H. C. T., aged 15. Disease of elbow-joint for three years, following an injury. Elbow excised, by *sub-periosteal* method, by Dr. Cheever. The patient remained three and a half months in the hospital, and recovered a very useful arm. He can carry a pail of water, dress himself, use his knife and fork, do up bundles, flex, extend, supinate, and pronate, and hold out a heavy octavo book at arm's length. There is a great spreading of the lower, sawed end of the humerus, and strong buttresses of new bone for the attachment of the flexors and extensors of the fore-arm.

(2) M. B., aged 24. Compound dislocation of elbow-joint, with lacerated wounds, from railroad injury; only the front of the bend of the elbow uninjured. The vessels, nerves, and bed of flexor muscles were sound. Pulsation continued in radial and ulnar. Elbow excised, by Dr. Cheever, December 24th. May 5th the patient was out of bed. July 7th he was discharged, well, and with a useful arm.

(3) C. C. C., aged 24. Disease of elbow; no injury; abscess and caries. Elbow excised by Dr. Thorndike. The patient was discharged, well, in three months.

(4) J. R., aged 63. Compound fracture of elbow-joint. Elbow excised, by Dr. Cheever, the ninth day after the injury, when suppuration was well established. Three days later (March 25th) he had a chill; this recurred on the two following days, and on the seventh day the patient died.

(5) P. K., aged 19. Compound fracture of elbow-joint. Immediate excision by Dr. Cheever. In five months the man was well, with an arm already quite useful.

(6) J. S., aged 22. Compound fracture of elbow-joint. Immediate excision of elbow by Dr. Thorndike. The case did badly, and the arm was amputated after two weeks. Recovery followed.

Excisions of the Shoulder. — (1) Mary R., aged 16, had her arm amputated, near the shoulder, for a railroad injury, some years before her admission to the hospital. The stump of the head and neck of the humerus was displaced inwards, appearing to press on the brachial plexus of nerves, and causing great pain. The head of the bone was excised, by Dr. Cheever; a large bunch of neuromata was also cut out of the axilla. In one month the wound was healed and free from pain. Some months later, pain returned, and fixed itself in the scapula.

(2) P. M., aged 25. Scrofulous disease of shoulder for years; abscess, eight months; shoulder dislocated downwards. The head of the humerus was excised by Dr. Cheever. In less than six weeks the man died of phthisis.

(3) D. O'B., aged 28. Caries of shoulder and sinus for three years. March 5th the shoulder was excised by Dr. Thorndike. Repeated hemorrhages after the sixth day, and death on the ninth day.

Excision of the Knee. — J. W., aged 5. Chronic disease of the knee for four years. The knee was excised by Dr. Cheever, and the joint found greatly disorganized. In one month the patient died of exhaustion.

Excision of the Ankle-joint. — The patient was 20 years old. Two months before entering hospital, when at sea, he fell from aloft upon the deck, and thence into the hold of the vessel, striking upon the chain cable. The whole distance was between seventy and eighty feet. The patient stated that both legs were broken just above the ankle; that splints made of orange-boxes were applied and kept upon the right

leg eight or nine days, but not as long as upon the left. The former had united well, without deformity, and promised to be a useful limb.

The left tibia and fibula were broken one and a half inches from the lower ends. The union of the tibial fragments was very firm; that of the fibula not as strong. The lower fragments were extensively comminuted, and with the foot were carried backwards, forming an angle of forty-five degrees with the upper fragments. The malleoli preserved their relative positions to the astragalus, and there was fair motion in the ankle-joint. The foot could be flexed to a right angle with the leg and placed upon the ground, but no weight could be borne upon it. A sinus had formed over the outer malleolus, leading down to carious bone.

While otherwise healthy, this young man was prevented from earning his living by the deformity; and, as there was a sinus leading into carious bone, his prospects of improvement were poor. Moreover, the union of the fragments was so firm, and the line of fracture so near the joint, that it would have been impossible to refracture the bones, and in that way correct the deformity. Taking into consideration these facts, and also the fact that the foot was entirely useless, and would probably remain so, Dr. Cheever decided, after a consultation, to perform excision of the tibio-tarsal articulation.

A vertical incision, four inches long, was made upon each malleolus, and the seat of the fracture carefully explored. A large piece of the lower fragment of the tibia was displaced backwards upon the tendo Achillis. Another part of this fragment was split off from the outside, and was attached to the lower fragment of the fibula, which was bent sharply backward at an obtuse angle with the shaft of the bone. All of these fragments were firmly glued together. With the knife and periosteum-scraper the soft tissues were cleaned from the lower fragments, and the ligaments of the ankle-joint divided. The ends of the tibia and fibula, including the malleoli and articular surfaces, were then sawed off just below the line of fracture, and a thin slice removed from the articular surface of the astragalus. All of this being done

through the original lateral incisions, none of the principal vessels were wounded. The bones were divided with a key-hole saw, copied from the plate of the saw used by Mr. Adams, of London, in his subcutaneous division of the neck of the femur. Hemorrhage was prevented by Esmarch's method; and when the tubing was removed, excellent circulation was restored in the foot, both the anterior and the posterior tibial arteries pulsating well. No tendons or nerves were divided in the operation. No vessels required ligature. The wound was gently plugged with two compresses filled with minutely broken sponges; it was then bandaged, and placed in a fracture-box.

For two months this patient did extremely well. The wounds granulated, and the sawed surfaces of the tibia, fibula, and astragalus had so far united by ankylosis that the man could lift his foot off the bed. Against advice he then left the hospital.

Four and a half months after the operation the patient was seen again. His wounds were about closed. There was no discharge. The ankle was movable about one-half the normal amount. The man could walk without crutches, and his general health was steadily improving.

Sub-Astragaloid Excision of the Tarsus. — This was a case of long-neglected disease of the foot in a child six years of age. There were five sinuses leading down to diseased bone. The child was etherized, and the operation performed by Dr. Cheever. The hemorrhage was controlled perfectly by Esmarch's method. The sinuses were enlarged, and almost the whole tarsus was found to be diseased. As the parents refused an amputation, to remove the diseased bones piecemeal was the only alternative.

Two long, horizontal openings were made on the inner and outer aspects of the tarsus; well back on the os calcis on the outside, and from the tubercle of the scaphoid forwards to the first metatarsal on the inside of the foot. The entire mass of vessels, nerves, and muscles, both on the dorsal and the plantar aspect of the tarsus, was peeled away from the bones with a blunt periosteum-scraper. Through

these two openings every bone of the tarsus, except the astragalus, was removed. The ankle-joint was not opened. The great cavity left between the astragalus and the heads of the metatarsal bones was then temporarily packed with two small compresses filled with minutely broken sponges, and the foot bandaged with a dry cotton roller. The rubber tubing was then taken off, and the whole hemorrhage, from beginning to end, did not exceed two drachms. Suppuration was established in forty-eight hours, and the packing was removed without pain or bleeding.

This child made an excellent recovery, and left the hospital, in about four months, walking well. A plastic material, moderately firm, had replaced the bulk of the tarsus.

Of the foregoing 22 excisions, 40 per cent. died. The relative mortality was — in excision of the shoulder, 66 per cent.; of the hip, 50 per cent.; of the elbow, 17 per cent. The mortality in the excisions of the shoulder and of the knee (a single case, fatal) was evidently exceptional.

The combined statistics of all the treatises on excisions, and of all the collections of cases which have been published, give a relative mortality, in a large series of cases, as follows:—

Shoulder, 25 per cent.

Elbow, 33 “

Hip, 50 “ *

Knee, 27 “ †

In other words, *recoveries* in excisions of the shoulder are three out of four; those of the elbow, two out of three; those of the hip, one half; those of the knee, three out of four.

Other statistics, however, show that in chronic disease of the knee excision is twice as fatal as amputation.

Now, if we combine the 22 excisions given in our present series with those of the first series of City Hospital Reports (28 in number), we have a total of 50 from which to draw conclusions.

* Hodges, Foote, etc.

† (472 cases), Swain.

The subjoined table gives the results of our cases, so far as they relate to the elbow, hip and knee : —

	Excisions.	Recovered.	Amputated.	Died.	Percentage of deaths.	Percentage of successful recovery.
Of the elbow	16	9	4	3	18	56
Of the hip	21	12	..	9	43	57
Of the knee	7	3	2	2	28	42
Total.....	44	24	6	14	..	..

Convalescence after excision is, at best, slow. From three to six months are required for a shoulder or elbow ; eight months for a hip ; and from twelve to eighteen, for a knee.

Excisions for disease give a larger percentage of recoveries than excisions for injury. The same is true of amputation. The diseased joint has already been through the inflammatory processes, and the system has become habituated to them. Yet there are certain conditions in disease that are not so favorable. Brodie first pointed out, and later observers have confirmed his statement, that, in a patient for a long while confined to bed, the bones undergo a sort of fatty degeneration, just as the muscles do. There is a loss of phosphates, and a softening of cancellous structure, under long disuse, which resembles the incipient stage of caries.

III. DISLOCATIONS.

There were received into the wards, since the first Report, 102 dislocations of the larger joints. This is irrespective of a large number reduced in the out-patient department, which did not remain in the hospital.

Forty-six (46) were dislocations of the shoulder ; thirteen (13) of the clavicle ; twelve (12) of the elbow ; five (5) of the hip ; four (4) of the knee ; six (6) of the wrist and ankle ; and four (4) of the spine.

The Shoulder.—Thirty-four of these cases were recent, and easily reduced, and do not merit report. Twelve of the dislocations were old, and will repay consideration. The period after injury to the time of admission to the hospital ranged from five days to three months. Six dislocations were into the axilla; four were sub-coracoid, and in two cases the direction is not stated.

(1) L. R., aged 72. Dislocation of head of humerus downwards into the axilla; five days' duration. Reduced with ether. At the end of one month the patient had regained one-half the natural motion of the shoulder.

(2) J. H., aged 60. Dislocation of humerus, of ten days' duration. Much swelling and pain. Reduced with ether. Pad in axilla, arm to side. Laudanum fomentations. Arm doing well when last seen.

(3) Catharine D., aged 45. Dislocation of humerus downwards, of twelve days' duration. Reduced with ether by pulling arm directly upwards. Remained three months in hospital, with passive motion employed. Could finally put hand on head.

(4) Ellen B., aged 42. Extremely obese. Dislocation of humerus downwards, of twelve days' standing. Repeated attempts at reduction. Etherized twice; plaster counter-extension, manipulation, and pulleys. Opinion differed among the surgeons as to whether perfect reduction had been effected. At the end of six weeks the patient went away, with but little motion in the joint.

(5) H. O'B., aged 55. Sub-coracoid dislocation of humerus, of fourteen days' standing. Reduced with ether and heel in axilla. In ten days the patient was discharged, relieved.

(6) W. H., aged 37. Dislocation of humerus, for twenty-two days. Reduced easily with ether. In five days he went out.

(7) Patrick R., aged 50. Sub-coracoid dislocation of humerus, of twenty-eight days' duration. Etherized. No success with heel in the axilla. Luxation reduced by placing foot on shoulder and pulling arm directly up. Pad in axilla; elbow to side. After one week the patient

could move the joint, and was sent out wearing his apparatus.

(8) Eliza A., aged 60. Dislocation of humerus into axilla, of forty-two days' standing. She says it was reduced at the time, and slipped out since. Reduced with ether and heel in axilla. Pad in axilla; arm to side; sling. Discharged in five days, at her request.

(9) Catharine C., aged 65. Sub-coracoid dislocation of humerus, for forty-nine days. Etherization, rotation, twisting, pulling, breaking up adhesions; heel in axilla; drawing arm directly upwards; pulleys. Efforts continued nearly one hour. Considerable shock. The head of the bone was slowly forced into place. Next day, patient feeble; venous effusion in axilla, and at bend of elbow. Two days later, patient better. After six days, a little motion was made in joint. Seventh day, no radial pulse; venous thrombus at bend of elbow. Twelfth day, radial pulse returned. Sixteenth day, absorption going on; motion better. Twenty-third day, patient can put hand nearly on top of head; thrombus disappearing; arm doing well. Discharged.

(10) J. E., aged 63. Sub-coracoid dislocation of humerus, for sixty days. He says it was reduced and came out again. Adhesions now firm, no radial pulse, and but little feeling in hand. Reduction slowly by rotation, stretching, bending, and manipulation under ether. Pad and bandages applied as usual. One hour later, arm cold and livid; bandages and pad removed; patient put to bed, and laudanum fomentations applied. Next day, arm warm, but shoulder swollen and very painful. The fourth day the patient eloped.

(11) J. S. P., aged 48. Dislocation of humerus into axilla, for seventy-seven days. It is firmly fixed there. Under ether the adhesions were broken up, and unsuccessful attempts at reduction were made. After two weeks the limb was moved daily to encourage a false joint. In one month more the man could put his hand on his head. In eight weeks after entering the hospital he was discharged, relieved.

(12) M. K., aged 38. Dislocation of humerus down-

wards into axilla, for ninety-two days. Attempts at reduction were made under ether, but without success.

Thus, no dislocation of more than sixty days was reduced; while the patient, dislocated seventy-seven days, and left with a false joint and passive motion, got a movable arm about as early as the patient dislocated forty-nine days, whose arm was put back in the socket.

Again, the cases of reduction (the patients 65 and 63 years of age), after forty-nine and after sixty days, were subjected to considerable peril of mortification; both lost the radial pulse, and one had a cold and livid arm. The risks of embolism, after thrombus, must also be considerable.

But if the unreduced arm is not treated at all, it is firmly bound by adhesions and useless.

After a dislocation of eight weeks' duration, especially in the old, or even middle-aged, we are inclined to think the best policy would be to break up adhesions moderately, under ether, and then to keep up passive motion in a false joint.

The Clavicle. — There were thirteen dislocations without fracture: eight were of the acromial end, four of the sternal end, and one of both extremities.

The dislocation of the *acromial* end averaged from two to four weeks under treatment. Treatment consisted in a pad in the axilla, keeping the arm to the side, and compresses and plaster; or strap around the shoulder and elbow; or, sometimes, a figure-8 bandage. The result is recorded as "good" in every case but one.

Two dislocations of the *sternal* end are recorded as treated by confining the arm and applying compresses and plaster straps over the projecting end of the clavicle. In these cases a fair result was obtained.

In one patient, aged 23, the dislocation of the sternal end of the clavicle was caused by the caving in of earth. The bone was very prominent; the head inclined to the injured side. The case was treated by pressure with compress and plaster; the arm bandaged to the side. The patient being

very restless, the apparatus was reapplied several times. At the end of four weeks the result was poor.

In the fourth case the patient was 62 years of age. The sternal end of the clavicle was very prominent. There was a large swelling. The sterno-cleido-mastoid muscle was very prominent and rigid; the head was inclined; the bone could be pushed down into place. Various forms of apparatus were tried: compress and plaster; figure-8 bandage; a strap over the shoulder, and Fox's clavicle apparatus. They were all unavailing to remedy the deformity. The patient was then put on his back in bed, with a narrow pillow between the shoulders. In this position the deformity was least; but the man was so restless that he could not be kept still, and all apparatus gave pain and produced effusion. At the end of four weeks there was no reduction of the deformity. The patient, however, could perform all the motions of the shoulder and hand excepting lifting the hand straight out, to a level above the horizontal.

In the remaining case the patient, aged 60, had a dislocation of both ends of the clavicle, and was treated with a bandage, plaster, two compresses, a figure-8 bandage, and a pad in the axilla. A fair result was obtained.

Dislocation of the sternal end of the clavicle is characterized by preternatural prominence, rigidity, and contraction of the sterno-cleido-mastoid muscle. In like manner dislocation of the acromial end is characterized by undue prominence and rigid shortening of the clavicular portion of the trapezius muscle. Subcutaneous section of these muscles would appear to be the most rational treatment in the upward dislocations, as they are the chief agents of displacement. When the sternal end is dislocated upwards and inwards, so as to press on the vessels or trachea, active surgical interference is certainly called for.

The Elbow. — The only noteworthy cases of dislocation of the elbow were each of two months' duration before treatment.

(1) S. R., aged 78, dislocated the elbow eight weeks before entrance to hospital. There is now marked deform-

ity. The olecranon projects unnaturally behind; the head of the radius can be felt displaced backwards and upwards; the arm is nearly straight, and the motion very limited. Attempts with ether, to reduce the dislocation by manipulation, were unsuccessful. The following day the patient was again etherized, the arm was forcibly flexed and extended, and the pulleys were used until a partial reduction was effected and pretty free motion attained. Subsequently there was great swelling, but no pain. Irrigation was employed, and passive motion. One month after the reduction the motion of the elbow-joint was only about *one-fourth* what it should be.

(2) B. P., aged 22 years, and a healthy young man, fell in the gymnasium while attempting the "giant swing." His teacher in the gymnasium, finding him unable to move his elbow, pulled on it, in a straight position, and then bandaged it to a straight splint. Nine weeks later the patient presented himself at the hospital with the elbow stiff and the arm nearly straight; the ends of both ulna and radius could be felt projecting behind the joint, and there was evidently an unreduced dislocation of both bones backwards. There was a slight power of rotation, but none of flexion. Under ether strong adhesions were broken up by Dr. Cheever, and by forced flexion and traction the fore-arm was drawn forward, and the dislocation reduced. A crepitation was felt in front of the joint, and, on releasing the fore-arm, it at once slipped out of place backward, and the ulna and radius projected as before. This manœuvre was repeated several times, until it was quite evident that the coronoid process must have been fractured at the time of the original injury, so that as soon as the adhesions were ruptured, there was nothing to keep the hook of the olecranon in place on the humerus.

A similar case of fracture of the coronoid process, in a young lad, was narrated in the first volume of City Hospital Reports. This fracture is extremely rare, and its occurrence at all has been repeatedly disputed. The fore-arm, in the present instance, was drawn into place, and retained over an internal angular splint, and the arm fomented. At

the end of seventeen days the splint was taken off, and the fore-arm kept in place itself. There was some power of flexion and good rotation. At the patient's urgent request he was discharged, relieved, but very strongly advised to have passive motion gently and persistently kept up for months. Like many other interesting hospital cases, he disappeared from observation.

The Hip. — Dislocations of the hip were five in number: three on the dorsum ilii; two into the thyroid foramen. Four were recent, and were reduced; one was old, and was not reduced.

(1) T. M., aged 23, dislocated head of femur on the dorsum ilii; treated immediately. Reduced, under ether, by manipulation; flexing, abducting, and rotating in with a lift. Knees bandaged together. Discharged, well, in three weeks.

(2) P. B., aged 35, fell through a stable hatchway, and produced a bad compound fracture of the leg and a dislocation of the head of the femur (on the dorsum ilii), on the same side of the body. The leg was firmly fastened in a splint, and, under ether, the dislocation was reduced by manipulation, as in the preceding case. The patient was advised to have the leg amputated, but refused. Three months later, after weeks of suppuration and necrosis, he begged for amputation. The operation was done, but he sank and died.

(3) S. M., aged 25, was struck by a bale of hemp on the buttock, and the head of the femur was dislocated into the thyroid foramen. With the fingers in the rectum, the head of the bone could be made out. All the classical signs of thyroid dislocation were present. Under ether the bone was reduced by manipulation: flexing, abducting a little, rotating inwards and adducting with a lift. The patient was well in two weeks.

(4) J. C., aged 41, recent thyroid dislocation. Reduced by manipulation, and discharged in eight days.

(5) Mary M., aged 68, had a fall eighteen weeks before entering hospital, and had been bedridden during that

period. There were two inches' shortening; marked inversion of the foot over the other instep; the knee was thrown forward; the head of the bone was easily felt on the dorsum, as the patient was much emaciated. No crepitus; loss of mobility; a great deal of pain. When brought to the hospital she had bedsores, typhoidal delirium, and exhaustion. She died in two weeks, and the dislocation was not meddled with.

One other case of dislocation of the hip came to the hospital, but did not enter, as little encouragement could be held out from any sort of treatment. Three years before, a strong young man met with an accident which dislocated the head of the femur upon the dorsum ilii. A "Natural Bone-setter" treated him, and the result, at the end of three years, was, two inches' shortening; foot inverted and pointed across the other instep; loss of motion; the head of the bone to be felt on the dorsum; slight mobility, and efforts to form a false joint.

The dislocations of the *spine* all ended fatally.

Dislocations of the *knee* were accompanied with other grave local injuries.

The dislocations of the *ankle* and *wrist* were frequently complicated with fracture.

A case of dislocation of the *astragalus* occurred, and was treated as follows:—

On January 5th, 1875, D. S., a healthy carpenter, 32 years old, while hanging some blinds on a new building, stepped backwards off the window-sill, and fell about twelve feet. He came down on his feet, on the ground, which was littered with loose bricks and building materials. The heel and arch of the left foot struck on a brick. He found himself unable to stand, and entered the hospital at once.

When seen by Dr. Cheever, soon afterwards, the foot and ankle had begun to swell moderately. The patient complained of great pain. There was no distortion, crepitus, or mobility above the ankle. Both malleoli were in place and firm. There was a bony crepitus at the neck of the astragalus. There was a very marked, partly rounded, and

partly sharp projection of bone between the inner malleolus and the heel. There was a depression beneath the outer malleolus. The rest of the tarsus and metatarsus seemed normal. The tendo Achillis was drawn tense, and shortened, over the unnatural prominence of bone which lay between the inner ankle and the heel. The heel was drawn up. The mobility of the ankle-joint was largely diminished. The last joint of the great toe was strongly and immovably flexed at a right angle.

The diagnosis was a fracture of the astragalus at its neck, and a dislocation of the whole body of the astragalus from between the malleoli and os calcis, inwards and backwards. Although the edge of the astragalus lay close under the skin in its new position, it did not seem to me that there was sufficient shortening of the foot upon the ankle to warrant the conclusion that the dislocated body of the astragalus had wholly escaped from the mortise of the tibia, fibula, and os calcis, but that a small portion of it still remained wedged between those bones.

The patient having been etherized, attempts were made by the surgeon and assistants, with extension and counter-extension, to press the bone back into its place, by alternately flexing and extending the foot, everting and inverting it, and so on; but without any effect.

Tenotomy next suggested itself. The tendo Achillis was divided, with good expectation of relieving the pressure, but without avail. Next the tendons usually severed in talipes varus were cut successively, namely, the tibialis anticus, tibialis posticus, and flexor longus digitorum. No result followed. The great toe remaining flexed at a right angle, it was evident that the flexor longus pollicis tendon was shortened by the projecting bone. Being unwilling to cut this near the ankle, where there was a double risk of injuring the nerve and making a compound opening over the dislocation, the tendon was severed near its insertion in the phalanx of the great toe. The toe was at once extended, but no change occurred in the dislocation. Patient and continued efforts still failing, it was apparent, on reflection, that the body of the astragalus had slipped over and behind that

process of the os calcis which buttresses up the inner side of the foot, and is known as the *sustentaculum tali*. Here it was inextricably and firmly wedged.

Two courses of treatment now suggested themselves, both having the sanction of numerous surgical authorities : —

1. To cut down upon the prominent bone, to divide all resisting ligaments and tissues, open the ankle-joint, and take out the astragalus ; the reason for doing this being that the dislocated bone acted as a foreign body, and pressed upon the skin so as to produce sloughing and a compound dislocation, ending in suppuration, caries, and disintegration of the joint.

2. To let it alone, wait for the occurrence of sloughing, suppuration, and so forth, and not to interfere by operation until these latter conditions required it. In favor of this, also, was the fact that, the tendons having been severed, spasmodic traction, and consequent nervous or even tetanic irritation, would not occur.

The second course was decided upon. The foot was secured immovably in a carved, outside Pott's splint, and the leg laid upon its outer side. The tenotomy punctures were covered with plaster, and the joint and dislocation dressed with a lotion of equal parts of laudanum and cold water.

For the first few days the swelling and heat of the foot were great. On the sixth day bullæ appeared. On the eleventh day a slough had declared itself over the most prominent part of the misplaced astragalus. On the sixteenth day the slough separated, but did not fully expose the bone. In three weeks more the ulceration under the slough had closed by granulation. In seven weeks after the injury the patient could freely move the foot, or parts whose motor tendons had been cut. His wounds and slough were soundly cicatrized ; the swelling was largely reduced ; there was no pain. The man could now go on crutches, and he was discharged from the hospital.

June 16th, five months after the injury, the patient walked with a cane. He could now step on the foot without a cane, but imperfectly. The ankle was still the seat of some effusion. The astragalus was prominent between the inner ankle

and the heel. The crepitus had disappeared. The gap under the outer malleolus was filled by a firm effusion, apparently of plastic material. The heel came to the ground. Danger of abscess, caries, or necrosis seemed to be past, and the prospect of a useful foot to be good.

The astragalus is so firmly set in a mortise, and held by such powerful ligaments, that its dislocation is rare. In the above case the patient received the force of the blow from a brick under the arch of the foot. The ankle turning outwards, the astragalus was fractured at its neck, and the body of the bone displaced inwards and backwards. Rupture of ligaments, as in sprained ankle, or a Pott's fracture, would occur nine times out of ten in such an accident.

IV. GUN-SHOT WOUNDS.

There were sixty-two (62) cases of gun-shot wounds: twelve (12) were fatal; giving a mortality of 19 per cent. So large a number of such accidents, occurring wholly in civil life, is a startling proof of the frequency with which arms are carried.

Twelve (12) persons were shot in and about the *thorax*; in eight of these the wound did not penetrate; four penetrated, and one of these patients died in the hospital.

(1) C. S. A., aged 34, was shot in the right side, three inches from the spine, and between the ninth and tenth ribs. The wound was one inch in diameter. The pleural cavity was opened in two places; the lung was wounded; the tissues were much lacerated. The patient sank in a collapse, and died in twenty hours.

(2) S. P. received a pistol-shot wound one inch above the left nipple. The ball lodged, and could not be traced. There was emphysema of the cellular tissue around the wound, with râles in the chest. Two days afterward the patient expectorated four masses of blood-clot. The wound suppurated. Two days later there was a slight expectoration of blood. Ten days later the wound was filled up, and the man went away; but he left the hospital with a hacking cough.

(3) Mary A. J. received a pistol-shot wound, one and a half inches below the left nipple, the pistol being held close to the body. The ball lodged, and could not be traced. There was bloody expectoration, and subsequently dulness on percussion below the left scapula. The wound suppurated. At the end of a fortnight she left the hospital against advice. At that date there was a large consolidation of the lung, with effusion in the pleura.

(4) Hattie M. received a wound from a small pistol, three inches from the sternum, and just below the left mamma. The ball lodged, and could not be traced. There was no hemorrhage, no expectoration, no cough; but great and early dyspnoea. Respiration over the lower half of the left lung disappeared, and there was orthopnoea.

Six days after the shot the left chest was tapped, and thirty-three ounces of bloody serum, with small clots, were drawn off.

Respiration returned, and the patient could lie down. Five days later the respirations were 25 a minute, and could be well heard over the left back. The patient was quite comfortable. Her friends took her away against the advice of the surgeon.

It would not be hazarding much to predict that the last three cases terminated fatally.

In 8,715 penetrating wounds of the chest, in the late civil war, the proportion of deaths was over 60 per cent. "Surgeons erroneously indulge in the belief," says the compiler, Dr. Otis, "that they save a majority of their patients with these wounds. The more rigorously the final results are traced, the higher the proportion of mortality rises."

In Case 4, the ball dropped into the pleural cavity, without wounding the lung, and gave rise to an effusion partly of blood and partly of serum.

In penetrating gun-shot wounds of the chest, three methods of treatment are open to us:—

First, to seal up the wound,—a mode which has now scarcely a single advocate.

Second, to pursue a strictly expectant course, and not tap

or open more freely the pleura, until pneumo-thorax, hemorrhage, or effusion calls for interference.

Third, to lay open the tract of the wound, and make at once a free and permanent pleural opening.

Without pretending to decide so important questions, we present the following case as illustrating the third method of treatment : —

While a young, healthy mechanic was at work in a planing-mill, driven by steam-power, a large belt parted at its coupling. The steel coupling-hooks, about an inch and a quarter long, and shaped like the letter S, were flung with great force across the room. One of them struck him on the side of the chest, over the lower part of the axilla, pierced his clothing, and buried itself in the walls of the thorax. When the patient was admitted a small wound was found, with a projection beneath, which suggested a broken rib. On enlarging the wound, the coupling-hook was found. One end had passed between the ribs, and was apparently hooked round a rib. On lifting the hook the puffing and whistling of air was heard. On extracting gently the hook, air gurgled in and out the pleural cavity with each inspiration ; some dyspnoea was present. There was no cough, and no bleeding. The rib was found to be broken. Compound fracture of a rib, a pleural opening, pneumo-thorax and future empyema were the contingencies. The bolder course was thought the wiser. The wound was freely slit up, the pleural sac more widely opened, and a small fragment of splintered rib extracted. The lung was not wounded, and it did not collapse, although air rushed freely in and out at each respiration. The wound was left open. The next day a very large effusion of serum began to be discharged from the wound. For days the bedclothes were soaked in this pleuritic effusion. A moderate pneumonia came on. Subsequently pus and serum together ran from the wound. Finally pure pus escaped, and as the pneumonia resolved and the lung expanded, the quantity of pus grew less and less. The wound of the chest-wall was kept sedulously open with tents, and the pleural cavity syringed out daily, with disinfectants, through a long elastic catheter. Adhesions of

the lung to the thorax took place, the cavity lessened, and finally the wound closed and the patient convalesced. Pleurisy, pneumonia, empyema, and adhesion went through their stages with an open wound, instead of in a closed cavity.

One year later this patient again presented himself at the hospital. Respiration was nearly perfect on the injured side. He was strong and active, and, what was most interesting, the side of the thorax had not collapsed and shrunk as it does in chronic pleurisy, after the effusion is absorbed. During the course of the diseased processes atmospheric pressure had been equal both inside and outside the thorax.

As we have stated, the lung did not collapse when the pleural cavity was freely opened. This opening was about opposite the lower third of the axilla. Dr. Smith's experiments prove that collapse of the lung does not take place if an opening is made in the side of the thorax opposite the middle of a lobe; but only when the opening is near the free edge of the lobe. In the living animal the lung never collapsed entirely when only *one side* was opened.*

Gun-shot wounds of the *head* were eleven in number; of these three recovered, and seven died, — a mortality of 63 per cent.

In two of the cases the wounds did not penetrate the inner table; of these patients, one died.

(1) J. W. received a pistol-ball a little to the right of the spine of the axis, in the back of the neck. The wound passed inwards and upwards. The ball lodged, and, though twice explored for, was never found. With a probe the base of the occipital bone, denuded, could be readily felt. The wound closed in seven weeks, and the patient was discharged, apparently well.

(2) W. F. received two pistol-shots in the head. Both balls were extracted. One was flattened on the frontal bone; the other was in the frontal sinus. Subsequently, delirium, stupor, and death in twelve days.

In two cases the skull was penetrated, but the dura mater was not opened; both patients died.

* Surgical History of the Rebellion, pages 631-2.

(3) H. F. T. shot himself at the junction of the frontal bone and the anterior, inferior angle of the parietal bone. The skull was fractured; it was trephined, and the ball found, lying on the dura mater, in two pieces. These, with fragments of bone, were extracted. The membranes were not wounded. The patient died in fourteen days of meningitis, followed by hemiplegia and coma.

(4) A. McC. shot himself in the right temple. He was conscious, but could not see. There was a blackened, ragged wound directly behind the external angular process of the frontal bone. The ball broke through the angle of the temporal fossa, exposed, but did not wound, a small portion of the dura mater, passed through the back of the right orbit, across the ethmoid bone, and was extracted from the left orbit. The right eye was disorganized. With the left eye the patient could see, the following day. He became delirious, restless, and exhausted, and finally sank into a stupor, and died on the third day.

There were four cases of penetrating gun-shot wound of the head. Of these, one recovered.

(5) A. C. had a pistol-shot wound of right ear into brain. Ball lodged. He died in sixteen hours.

(6) H. A. L. had a pistol-shot wound of right temple. The ball lodged in the left hemisphere of the brain. He died in one hour after he was found.

(7) J. D. had two shots in the head, of which one penetrated. He died in half an hour.

(8) J. D., 14 years old. Two pistol-shot wounds of head, one and a half inches apart; one inch above and forward of the ear. The first entered the skull; the second was doubtful. There was a loose piece of skull between the wounds. The balls were not found. Brain substance, mingled with pus, was afterwards discharged from the wound. Fragments of bone were removed twice. In two months the wounds were healed, and the patient was discharged.

In three cases balls entered the base of the skull, and were lodged. Of these, only one ended fatally.

(9) G. M. L., a little girl of three years, received a

pistol-ball, from a pistol held to the ear, in the right external auditory meatus. The edge of the anti-tragus cartilage was chipped off by the ball. There was large venous hemorrhage. The petrous portion of the temporal bone could be felt rough and fissured at the bottom of the meatus. The ball could not be found. The child was conscious, and vomited. There was facial paralysis on the right side. Suppuration came on, and was profuse at first, and then moderate. There was no other head-symptom, after a few days of headache and fever. She soon got up, and ran about the ward; played, ate, and slept. At the end of seven weeks her friends took her away. She still had facial paralysis, and a discharge from the ear; otherwise she seemed well. Her subsequent history could not be traced. The probability of necrosis, meningitis, and abscess near the cerebellum, would appear to be great.

(10) E. M. held a revolver in his mouth and shot himself at the junction of the hard and soft palate. A probe passed up to roughened bone at the base of the skull; the ball could not be found. The patient was conscious, and had left hemiplegia; convergent strabismus; dilated and insensible pupil; obscure vision, and ptosis of the lid of the right eye. No facial paralysis. At the end of two and a half months he could walk fairly, and use his left arm partially. He could raise the right eyelid; the strabismus and imperfect vision remained. There was no sensation of taste on the right side of the tongue. The wound of the palate had cicatrized, leaving a sinus. He had much neuralgia, frequent congestive headaches, with flush of face and suffusion of the eyes; otherwise he seemed well. After four and a half months he was discharged from the hospital, with his condition unchanged.

(11) Mary F., aged 22, two weeks after her confinement, shot herself in a puerperal mania, holding the pistol under her chin. The ball passed beneath the lower jaw, into the mouth, through the tongue, and through the soft palate to the base of the skull. It lodged, and could not be found. A probe touched rough bone at the base of the skull. The sight of the right eye was impaired. There

was no paralysis. She was conscious. Great swelling of the mouth and throat came on; with it delirium and noisy, labored respiration. The patient died in five days.

Gun-shot wound of the Spinal Canal. — M. C., aged 6, received a pistol-ball at the middle of the right sternomastoid muscle. There was no wound of exit. The symptoms were slight. There was no paralysis. Under ether, the course of the ball was found to be inward and backward to the cervical vertebræ. Near the bodies of the third and four vertebræ rough bone was felt, and a profuse venous hemorrhage occurred, excited, apparently, from the vertebral veins. It was not thought justifiable to proceed further. The child died at the end of four days. During this time a profuse serous discharge ran from the wound and saturated his pillow. He died in delirium, and from constitutional irritation. At the autopsy the ball was found in the spinal canal, lying on the cord, but not having perforated the membranes. There was no paralysis. The serous discharge was cerebro-spinal fluid.

Serous discharge from the ear in injuries of the base of the skull I have seen but once in this hospital. Either such discharges are more rare than has been described, or they are mingled with blood.

In this connection it is interesting to note the fact, that among six hundred and forty-two gun-shot wounds of the vertebral column, recorded in the Surgical History of the War, only *seven* cases of tetanus occurred.

V. THE RELATIVE MORTALITY OF INJURIES OF THE HEAD WHERE BLEEDING FROM THE EAR WAS PRESENT.

We have collected from the Hospital Records twenty (20) cases of head injuries where bleeding from the ear was a prominent symptom. These we now propose to narrate concisely, and then to compare the results, giving first the fatal cases, and, secondly, the recoveries.

Fatal Cases. — (1) J. D., aged 27, was run over by steam-cars; fracture of skull, with depression; bleeding

from both ears; stertor; loss of consciousness; death in two hours.

(2) J. S. D., aged 20, steam-railroad injury; compound fracture of skull; bleeding from right ear; dilated pupils; pulse, 56; death in thirteen hours.

(3) W. G., aged 40, fell two stories; unconscious; paralysis; stertor; bleeding from right ear; pulse, 130; death in five hours.

(4) A. R., aged 26, was thrown from a wagon; insensible; bleeding from right ear; right pupil dilated; right divergent strabismus; relaxed sphincters; pulse, 60; bruise and swelling behind right ear; no external evidence of fracture; left hemiplegia ensued in three hours; death, without rousing, the next day.

(5) E. B., aged 45, fell from the horse-cars on to his head; bleeding from the right ear; coma; pupils contracted; pulse, 45; an effusion under the scalp behind the right ear; incision revealed a fracture, but no depression; left hemiplegia supervened; death in two days.

(6) C. F., aged 24, fell through a hatchway on to head; partially conscious; bruising of eye; bleeding and serous discharge from left ear; no paralysis; pulse, 54, and feeble; several days later, sudden death, without new symptoms.

(7) J. C. was found lying unconscious; bleeding from left ear; right pupil dilated, left contracted; pulse slow and irregular; respiration imperfect; paralysis of left side; could not be roused; death in four hours. Autopsy: a clot $1\frac{1}{2}$ inches by $4\frac{1}{2}$ inches was found under the parietal bone; there was a stellate fracture behind the right ear, extending into the base of the skull.

(8) E. N., aged 33, was found in the gutter, insensible; bleeding from the nose and right ear; pupils contracted and insensible to light; no ecchymosis of conjunctiva; pulse, 36, and intermittent; respiration, 25, and puffing; limbs rigid and twitching; scalp-wound over right parietal bone; wound enlarged, and no fracture found; death in twelve hours. Autopsy: clots at base of brain; a comminuted fracture of base, running in four different directions.

(9) N. S. jumped from a window; free bleeding from

both ears, but no serum; brain substance from left ear; comatose; left pupil the larger; both pupils insensible to light; respiration slow; pulse, feeble, 112; died very soon. Autopsy: a large effusion of blood, and laceration of the brain; extensive fractures through the base of the skull.

Recoveries. — (1) L. M. was found insensible at the foot of a flight of stairs. He was bleeding from the right ear; had blowing respiration, contracted pupils, and was wholly unconscious. Next day the pupils responded to light, and he seemed stronger. Third day he told his name, and asked for food. In one week he was doing well, but talked a little thick. In two weeks he talked, ate, and slept as well as ever. In three weeks he was discharged.

(2) P. W. G. was knocked down by a runaway horse; was semi-comatose; bleeding from left ear; there was no scalp-wound, or sign of fracture. He could be roused temporarily. An ice-bag was applied. In eight days his tongue was clean; pulse, 90. He could walk and converse well. He was discharged.

(3) S. D., aged 21, was thrown and kicked by a horse. He had a severe bruise above and behind the left ear. There was no proof of fracture. Bleeding from left ear; pupils normal; pulse, 60; partially stunned. Ice-bag and cathartic. The second day he had headache; pulse, 55; slept a great deal. Fourth day, better; pulse, 65; less pain and somnolence. Eighth day, said he felt as well as he ever did. Tenth day he was discharged.

(4) J. H. fell downstairs; struck on head; insensible; very large bleeding from left ear; strabismus; coma; pulse, 60. Partial collapse followed; brandy enema and warmth. Rallied and was more conscious. A swelling behind the left ear was cut down upon, but no fracture found. Ice and cathartic. Next day restless slumber. Could be roused; required catheter. Third day slept most of time; could be roused, and answered intelligently; passed urine in bed. Sixth day had come out of his stupor; attended to the wants of nature himself. Ninth day not so well; dull. Thirteenth day somnolent; urine in bed; conjunctivitis. In three

weeks, improving; bright, sensible; natural functions perfect. After four weeks, discharged, relieved, at his own request.

(5) E. O'B., aged 37, fell out of a second-story window while intoxicated. Bleeding from left ear and from nose; pupils contracted, do not respond to light; not quite insensible; no paralysis; constantly turns on left side. Next day brighter; pupils respond; restless; dozes. Third day can answer questions. Fifth day sits up; mind not clear. Tenth day much the same; was taken away by his friends.

(6) J. V., aged 26, fell sixty feet. He was picked up unconscious; bleeding from the ear; pupils normal; pulse, 116, and weak; a fractured rib; complains of side on rousing. Fifth day complains of pain in head, for the first time. Sixth day more severe pain in head; renewed bleeding of ear; restless and delirious; leeches were applied. Eighth day head-symptoms worse. Ninth day paralysis of left side of face, none of the limbs; difficult urination. Sixteenth day improving; sat up two hours. Twenty-first day he was discharged, not well, but gaining apparently.

(7) M. L., aged 40, struck on the back of the head with a large iron tea-kettle; was rendered insensible; bleeding from mouth, nose, and ears; continued bleeding from left ear; vomiting, headache; dull and stupid; pupils dilated, but respond to light; pulse, 64; respiration, 36. Second day severe pain in head; hair cut short; ice-bag applied. Fourth day better; still dull; no bleeding; some vomiting. Eleventh day improving; appetite good; bowels regular; pulse, 72. Nineteenth day discharged, relieved.

(8) J. H., aged 26, fell twelve feet on his head. Partially conscious, and could be roused; spasmodic contraction of muscles; considerable bleeding from the ear; pulse, 52; pupils normal; no paralysis, no scalp-wound, or depression. Hair cut; ice to head; catheter required. Next day drowsy; dilated pupils, pulse, 52 and irregular; Croton oil given. Second day complains of headache; pupils normal; pulse, 44, and irregular; tongue dry; catheter. Third day better; less headache; tongue moist; pulse, 48. Fifth day controls

bladder. Sixth day tongue moist; pulse, 60. Eighth day great improvement. Tenth day eloped.

(9) E. H. S., aged 35, an epileptic. He was seen to fall heavily in the street while walking; struck on head, behind left ear; bruising and extravasation; no scalp-wound; bleeding from left ear, and from nose; is confused; pulse, 60; ice and cathartic. Next day bleeding had ceased. Fifth day right pupil dilated and sluggish. Seventh day better; eyes normal; less stupor, though still drowsy. Tenth day intelligent, but still complained of head. Twelfth day he was discharged, because he insisted on going.

(10) J. J. fell into the hold of a ship; became insensible, but had sensation and motion in his limbs; dry blood in his right ear; bleeding from left ear; tenderness behind left ear; no scalp-wound or depression felt. Next day still unconscious. Fourth day better; has spoken; pupils respond. Ninth day opens eyes and answers questions. Twenty-third day much better. Thirty-first day is deaf, and covers his left eye with his hand when he looks at anything; otherwise seems well. Thirty-ninth day, discharged.

(11) Mary M., aged 60, fell into a basement twenty-five feet; insensible; smells of rum; pupils do not respond; bleeding from right ear; pulse, 66; bruise behind right ear; right leg not moved; right arm broken. Next day restless; blowing respiration; involuntary evacuations; can move right leg a little; in the evening she drank some milk. Second day, pulse, 78; bleeding from ear has ceased; attempts to speak; passes urine in bed. Third day, eyes injected; makes a groaning noise continually. Fourth day, sits up in bed, and tries to speak. Sixth day, sleeps all the time. Ninth day, got up and walked; eats. Tenth day she seemed foolish. Fourteenth day, up and about; well, but silly. Twenty-eighth day, seen by expert, and by his advice sent to an insane asylum.

(12) We can add here a twelfth case from private practice:—

M. L., aged 45, fell backwards, from a height of eight feet, and struck his head on a brick pavement. He was wholly insensible; partially stertorous; pupils contracted;

no paralysis; a large extravasation and swelling behind the left ear, but no scalp-wound or depression of bone. There was a large bleeding (venous) from the left ear, which continued twelve hours. The third day he returned to consciousness, and slowly but steadily improved. It is now four months since the accident, and he remains perfectly well, except a deafness of the left ear.

We have, then, a total of twenty-one (21) cases of head-injury with bleeding from the ear. Of these, nine (9) ended fatally, and twelve (12) recovered, or a mortality of $42\frac{6}{7}$ per cent. The record of some of those marked "recovered" is open to the criticism that the patients left the hospital, and eluded subsequent observation, before time enough had elapsed to give a final prognosis. Yet the fact remains, that over one-half of these twenty hospital patients, after presenting symptoms often thought characteristic of fracture of the base of the skull, did not die outright, or within forty-eight hours, as such fractures usually have been thought to terminate, but survived for indefinite periods, and many had a fair chance of final recovery. It will, perhaps, be readily admitted that the majority of surgeons regard bleeding from the ear as among the most fatal symptoms of head-injuries. It may even be doubted whether serous discharge unmixed with blood (a rare symptom) can be justly regarded as a more serious one, inasmuch as the serous fluid may come from the chambers of the inner ear (liquor Cotunnii) if of moderate amount. If really sub-arachnoid fluid, it has been shown, more recently, to escape from a rent of the arachnoid, where it expands over the exit of the auditory nerve. Either of these fluids, blood or serum, flowing from the ear in head-injuries, and accompanied by facial paralysis, leaves no doubt of fracture, through the aqueduct of Fallopius, in the temporal bone, and hence, practically, of fracture of the base of the skull. In one, at least, of the cases, that of the patient who lived three weeks, and left the hospital, facial paralysis was present. In several instances there was partial hemiplegia.

There seems to be no sufficient reason why fracture of the base, *per se*, should not pass undetected, or repair and recover as well as fracture of the vault. Displacement, or depression, from fractures of the base is rare; such fractures are necessarily simple, as opposed to compound, and may undoubtedly close and unite by bone, without subsequent symptoms.

The danger from fracture of the base arises from two causes:—

I. Proximity of the large vessels to the fracture, and of effusion of blood.

II. Probability of laceration of the brain substance, owing to the irregular bony surface of the base of the skull. To this may be added the fact that the base is the most vital part of the brain.

The mortality of fracture of the base, as verified by autopsy, is very large; so much so as to cause it to be regarded as a necessarily fatal injury. How many cases of fissures through the petrous portion of the temporal bone recover, we shall never know.

We certainly, however, may see some reason for encouragement in the large percentage of recoveries in the above series. Many of these were obviously severe injuries; and some, in all probability, were fractures of the base. It is, in fact, difficult to understand where a large venous hemorrhage can come from, when it flows from the auditory meatus, unless from ruptured sinuses inside the head. The superior petrosal sinus, and also the great lateral sinus, are in immediate proximity to the ear-passages; and the bony wall which covers in the latter is very thin just behind the mastoid process; as is also the septum between it and the auditory meatus. It is worth noting, in this connection, that almost every case of the above series had extravasation and swelling, from the blow, behind and above the ear. Undoubtedly a ruptured tympanum, or a torn mucous membrane of the middle chamber of the ear, may, occasionally, be the source of the bleeding; but a large bleeding could not come from these alone.

Bleeding from the ear, then, in severe head-injuries, is not a diagnostic sign of a fatal result.*

VI. COMPOUND INJURIES OF THE KNEE-JOINT.

These were five in number, and conservative surgery had, with them, a disastrous result. Most of them refused amputation. They all ended fatally.

(1) G. D., aged 55, five days before entrance received a wound of the knee-joint from a nail while breaking a board over his knee. On admission there was a fluctuation in the joint; redness and tenderness; pulse, 120; no chills. Second day, tongue dry and loaded; pulse, 120; knee the same. Third day, a blush upon skin, with red lines running up the inner side of the thigh; more decided fluctuation in knee; tongue brown and dry; pulse, 120, small; mind wandering; two long incisions were made on inner side of knee. The next day the patient died. Pus, with softened and eroded cartilages and denuded bone, was found in the knee-joint; no metastatic abscesses.

This case of intense arthritis ran its whole course in ten days.

(2) M. N., aged 32, cut into the knee-joint with a drawing-knife. The wound was sealed, and a ham-splint applied. Delirium tremens; suppuration; free openings; finally a drainage seton; death from acute arthritis in seventeen days.

(3) E. A. L., a mechanic, fell from a staging, a distance of thirty feet, striking on a pile of rubbish—stones and broken brick. The patella was comminuted, and at its lower, inner border a compound opening appeared, through which

* Bryant gives thirty cases of head-injury; twelve recovered and eighteen were fatal. Of the twelve which recovered, three had sub-conjunctival ecchymosis; eight had bleeding from the ears; seven had facial paralysis.

The autopsies of the eighteen fatal cases showed: four cases of sub-conjunctival ecchymosis, with fracture through the orbit; two of hemorrhage from the ear, with fracture of the petrous portion of the temporal bone; three of the patients had epistaxis, of whom one had fracture of the ethmoid, one of the frontal sinus, one of the lateral sinus; seven had laceration of the brain; and seven died from meningitis.

the finger could be passed into the knee-joint. The ligaments within the joint were ruptured, and the insertions of the vasti muscles were lacerated. The joint was filled with blood. The opening into the knee was enlarged, several loose bits of patella, with some of the articular and inter-articular cartilage were removed, and a counter-opening was made on the outer side of the joint to allow free drainage.

Suppuration of the joint, with repeated secondary abscesses and bedsores, finally wore the patient out, and he died of exhaustion in the eleventh week.

(4) M. P., aged 19 years, received a pistol-shot wound of the knee twelve hours before his admission. On the inner side of the right knee, opposite the lower edge of the patella, was the wound of entrance; no wound of exit was apparent. When the limb was straight, the probe could not trace the track of the bullet beyond the subcutaneous cellular tissue; but, on flexing the knee, a distinct opening into the joint was detected. The wound of entrance was enlarged by a crucial incision, when it became apparent that the ball had struck the internal condyle of the femur at the inferior and posterior part, and, having splintered the bone here, had glanced and was lost either in the joint or in the muscles of the calf. The joint was filled with blood. The bullet was not found.

A crucial counter-opening was made at the outer side of the knee, and the joint was syringed with cold water. The limb was put on a splint, in a semi-flexed position, and the opened joint freely irrigated. Repeated chills, with low, typhoidal delirium came on, and the patient died in sixteen days. The autopsy revealed a slight chipping of the inner condyle of the femur; ulceration of cartilage; the ball in the popliteal space; metastatic abscesses in the lungs, and in the temporal bone.

The slight primary injury of the articulation, and the fact, ascertained by passing the finger through the counter-opening into the joint, that the articulation did not contain the ball, any foreign body, or shattered bone, had induced the attempt to save the limb by free incisions, rest, syringing and drainage. Amputation was clearly indicated after the

first week, but the patient was never in a condition to survive it.

(5) H. B. R. received gun-shot injuries of both legs from a fowling-piece loaded with shot. The left leg had a compound fracture of both bones, with laceration, and was amputated. The right leg had a severe laceration and burn of the flesh, two inches below the knee; the tibia was denuded, roughened, and had a longitudinal split in it. Suppuration, with foul gas, formed in the knee-joint. On the ninth day it was amputated. The patient survived only eighteen hours. The autopsy revealed a chink-like opening into the knee-joint through the head of the tibia. Air had been forced into the joint by the explosion of the gun. Acute arthritis followed. The cartilages were found softened and green, and the bone was denuded.

Prompt primary amputation might have saved Cases 1 and 3, perhaps also Cases 2 and 4. The latter patients were both hard-drinkers. It is quite doubtful whether Case 5 would have survived a double amputation.

In striking contrast with the above cases the following one is presented, as showing with what impunity the knee-joint may be scientifically opened.

Removal of a Floating Cartilage from the Knee-joint.—Miss —, 20 years of age; three years ago met with an injury of the right knee by a fall; was confined to bed three months; and has had trouble in her knee ever since. She is often lame; there is a little swelling and tenderness. A hard, loose body can be felt slipping about in the joint; it is best brought to the surface on the inner side of the patella. She has been so continually troubled by it that she desires an operation.

Acting upon a valuable hint from the old work of Benjamin Travers on "Constitutional Irritation," Dr. Cheever confined the patient strictly to bed, and put the leg on a ham-splint, for one whole week before the operation. This was done both to secure entire rest of the joint, and to accustom the system to confinement. The result of confining the

limb on the ham-splint was a restless night; a coated tongue, a quickened pulse, and general irritability and feverishness. This continued a day or so, and gradually subsided. Meanwhile the appetite and the bowels accommodated themselves to the confinement; at the end of a week the system was perfectly tranquil. The patient was etherized and put upon the operating-table. The ham-splint was then removed. The knee was forcibly flexed, so that the heel touched the nates. The floating cartilage became prominent just inside the patella and over the inner condyle of the femur. The operation by a single direct incision was decided on, as it would be difficult from the size and shape of the cartilage to slip it out into the cellular tissue. To prevent the cartilage from slipping back into the joint, a long steel needle was pushed through the skin and into the cartilage, and the end held firmly by an assistant. An incision was now made directly down upon the projecting cartilage, and it was partly squeezed and partly lifted by the needle, out through the opening. The needle was withdrawn and the cartilage extracted.

The wound was immediately closed by pressure with dry charpie, plaster and bandage. The knee was straightened and fastened again on the ham-splint. The patient was removed to bed. Not the slightest constitutional fever followed. There was a little pain for a day or two, but not severe. No swelling supervened. The knee-bandage loosened day by day. The patient was kept at rest two weeks; then she went about, and the functions of the joint were perfectly restored. The cartilage was seven-eighths of an inch long and five-eighths broad.

VII. TRACHEOTOMY.

This operation was done nine times: three times for croup, and six times for other causes.

(1) E. D., aged 11 months; croup of two days' duration; tracheotomy and steam-room; tube removed on the fifth day; discharged, well, in eighteen days.

(2) M. A. C., aged $4\frac{1}{2}$ years; croup of three days; quite

livid; pulse, 156; tracheotomy and steam-room; comfortable for twenty-four hours. Second day, membrane coughed up; patient rallied, but later collapsed, filled up in lungs, and died in forty-eight hours.

(3) C. C., aged 3 years; croup; lividity; half-conscious; pulse, 180; tracheotomy and steam-room; relieved, but always had rapid pulse and breathing; died in forty-eight hours.

(4) M. C., an adult, with syphilitic ulceration of the larynx; tracheotomy, with entire relief; tube worn many months.

(5) M. N., aged 59; malignant disease of throat and larynx; tracheotomy; relief; tube worn for months.

(6) C. T., aged 47; erysipelas and exhaustion; sudden swelling of neck with choking; laryngotomy; relief; death from exhaustion, not from dyspnoea, in twelve hours.

(7) G. W., aged 44; tonsillitis and œdema of glottis; tracheotomy; relief; died, in forty-eight hours, of œdema of the lungs, etc.

(8) M. W., aged 30; chronic laryngitis; tracheotomy; exhaustion; entire relief; tube taken out in five days; on the sixteenth day the patient died of other causes.

(9) M. O. R., aged 40; œdema of glottis; livid; tracheotomy; entire relief; tube out in five days; recovered.

In tracheotomy for croup, one recovered, and two died; a mortality of 66 per cent.

In the first City Hospital Reports are notes of four cases recovered, and five fatal; a mortality of 55 per cent.

Combining the two reports, we have twelve cases of tracheotomy for croup: of these, five recovered and seven died; a mortality of 58 per cent.

In tracheotomy for other causes, in this report, we have four recoveries and two deaths; a mortality of 33 per cent. In the first report are notes of five recoveries and one death; a mortality of 16 per cent.

Combining both tables, there are twelve cases of tracheotomy for other causes than croup: nine recoveries and three deaths; a mortality of 25 per cent.

The case referred to above with malignant disease of the

larynx, several weeks after tracheotomy, and still wearing the tube, was operated on by laying open the larynx. The disease, however, was found too extensive to be removed. The larynx healed over, and the patient was discharged, wearing his tube.*

Tracheotomy is not infrequently called for in cases of cut-throat, where it is practised with invariable relief, and adds much to the safety of the patient.

In the operation of removing the upper jaw, tracheotomy has been repeatedly done at this hospital as a preliminary step to the other operation. Its advantages are: perfect safety to the patient from suffocation by blood; ease to the operator, since the mouth can be packed with sponges, and the surgeon work at his leisure; lessened danger of death from shock (which has occasionally happened), since the patient can be operated on in the recumbent position. We have never seen trouble arise from opening the trachea in these cases.

Tracheotomy for a Foreign Body. — A child, 3 years old, swallowed a small shawl-pin, which remained in the trachea for six weeks. Broncho-pneumonia ensued. Subsequently the lungs nearly cleared, but symptoms of tracheal irritation being very manifest and constant, the physician advised tracheotomy. Under ether, the trachea was opened by Dr. Cheever, and a glass-headed shawl-pin, one inch and five-eighths long, was extracted. Recovery promptly ensued.

VIII. AN OPERATION TO RELIEVE OBSTRUCTION OF THE BOWELS BY A BAND.

The following case is thought to be sufficiently instructive to warrant its preservation in a permanent form: —

J. Y., 7 years of age, was suddenly attacked with pain in the abdomen and obstinate constipation, followed by vomiting, tympanites and tenderness. A physician treated him at first for the constipation, with castor-oil, large enemata,

* Compare case of opening the larynx reported in the first Report.

and other cathartics. The medicines were vomited; and nothing came from the rectum but the enemata. On the fourth day of the sickness he was seen by Dr. J. G. Blake. The symptoms were the same. Dr. Blake gave no cathartics, but a warm enema, of two quarts, and hot fomentations to the abdomen. The following day he asked Dr. Cheever to see him, with a view to using puncture to relieve the tympanites. The child was sitting up, straining at stool, but nothing came from the rectum but a little clear serum. The belly was enormously distended, and a huge coil of intestine, supposed to be the colon, revealed itself in outline across the abdomen. There was general tenderness, but not very great. Not much retching. No tumor or hard spot was felt in the abdomen. The child's general condition was not so feeble as might have been expected.

Dec. 30th, 1871. — He was taken to the hospital, and repeated punctures were made into the distended intestine with the aspirator. A good deal of foul gas came away. The abdomen relaxed; the child appeared relieved, and was able to retain nourishment. He was fed upon small quantities of milk and lime-water, a little sherry, and opium. Hop-fomentations to abdomen.

Dec. 31st. — He rested better last night, and retained his food. But to-day the abdomen has filled up again, and the distress from the distention has returned. The punctures were repeated with as good result as before. Treatment was continued the same.

Jan. 1st, 1872. — A little worse; no relief to the bowels. Is kept a little under the influence of opium; retains his food. The question of an operation was mooted, but Dr. Cheever was reluctant to undertake it.

Jan. 2d. — The case had now reached the *eighth* day since the attack. The child was obviously failing. Distention and distress were great. No passages downward of fluids or flatus. It was clear that the obstruction was not to be relieved by ordinary measures. There was, however, as yet, none of the collapse which indicates mortification; nor were the symptoms of abdominal tenderness very acute. An unfavorable prognosis was given, and the parents were very

urgent for an operation. Seconded as they were by medical advice, Dr. Cheever consented to try this last expedient, without, however, holding out much hope to them.

Operation.—The child was etherized, and the abdomen opened by a vertical incision. The intestines were so distended that they concealed the cavity of the abdomen, and prevented any search for the stricture through this incision. A cross incision was therefore made, and the abdomen explored with the hand. There was present a moderate degree of peritonitis, but no effusion in the abdomen, either serous or faecal. The puncture-marks in the intestine were seen, closed up, without extravasation or external redness. The obstruction was found in the ileum, just above the cæcum. The ileum was much distended above this point, but empty and collapsed below, and so was the large intestine. There was no invagination or intussusception. The ileum was twisted and held by a band of adhesion, which looked old. This was easily severed, and the bowel untwisted. Air immediately passed through, and there followed at once an enormous liquid and gaseous discharge *per anum*. The abdomen was now closed as rapidly as possible, warmth applied and stimulants given. The abdomen was closed in the more readily since the bowels sank down after the discharge.

The child did not rally, but died in a state of collapse after three hours.

The instructive points in this case are :—

1st. That when we open a tympanitic abdomen, we had better puncture the intestines with the aspirator, or we shall be obliged to make a crucial incision. There might, however, be more difficulty in promptly finding the obstruction, if we had not the distended bowel to guide us to the stricture.

2d. Punctures with the aspirator do not cause extravasation or inflammation; neither do they afford permanent relief in tympanites.

3d. Immediate resumption of the peristaltic movement of the bowels as soon as the stricture was relieved.

4th. The operation was done too late.

Abdominal surgery has been so far advanced in compara-

tive safety by the experience of ovariologists, that Dr. Otis, in the exhaustive History of the Surgery of our late War, ventures to predict, that in gun-shot wounds of the abdomen, with pressing symptoms, the practice of abdominal section, search for the ball and prevention of extravasation, may eventually become common, and more successful than the fatal inactivity now the rule. In like manner may we not look forward to an increasing percentage of recoveries in operations to relieve intestinal obstructions — a ratio of success comparative with our early and accurate diagnosis?

In a case of such hopeless nature it is painful to any physician of sensibility to stand by and do nothing, when an examination, *post-mortem*, reveals the cause of death to be purely *mechanical*, and capable of relief from a touch of the finger, could it have been rightly applied.*

IX. SECTION AND REMOVAL OF THE SUPERIOR MAXILLARY NERVE AND MECKEL'S GANGLION, FOR NEURALGIA.

CASE I. — B. D., 61 years of age, a fisherman by occupation; first had neuralgia, thirty-one years ago, in his right cheek. It followed him, at intervals, until eight years ago. It then became more constant, and has so continued. It has required a large amount of morphia to keep him easy; and latterly his single dose, subcutaneously, has been one and a half grains. His right cheek is shrunken; his right pupil smaller than the left. Pain is confined to the region of the infra-orbital nerve, and its distribution.

Jan. 3d, 1873. — Dr. Thorndike operated to cut and remove the sensitive nerve-trunk, and its ganglion. The patient was etherized. A V-shaped flap of skin was raised from beneath the right eye and over the cheek. The trunk of the infra-orbital nerve was dissected out and turned up. A medium-sized trephine was used to penetrate the antrum.

* See the *Medical Record* for July, 1875, for a case of operation, for a similar obstruction, at the Bellevue Hospital. The obstruction was not relieved, and the patient died; but the autopsy demonstrated the feasibility and propriety of an earlier surgical interference.

The bony wall of the infra-orbital canal, between the antrum and orbit, was chipped away, and the nerve drawn out of its bed. The posterior wall of the antrum was then perforated and chiselled away, and the spheno-maxillary fossa opened. The nerve was traced back to near the foramen rotundum and cut off, and with it the spheno-palatine ganglion was removed. There was only a moderate hemorrhage, and but two vessels were tied. The skin-flap was apposed with sutures, and cold-water dressing applied.

Jan. 10th. — It is reported that there has been no pain since the operation.

The patient had a smart attack of facial erysipelas, from which he recovered. The wound healed, and he was discharged, well, February 3d, — one month after the operation. There had been no recurrence of pain.

CASE II. — Martha T., aged 65, has had a typical case of *tic douloureux* for eighteen years. The original seat and the present focus of the pain is in the left cheek and side of the nose, below the orbit. Pain radiates, however, to the chin and temple of the same side. It also crosses to the other side of the face, and runs through the distribution of the tri-facial nerve on the right side. It is intermittent, remittent, paroxysmal, epileptiform, by turns. The sudden coming of a person into the room, an unexpected sound, a draught of air, an effort to use the jaws in chewing, will bring on as instant and intense a seizure as if produced by the galvanic current. Violent and abrupt pain, convulsive action of the facial and circumorbital muscles, with reddening of the skin, congestion of the eye, and a flow of tears is instantly produced, and then subsides. It is to this form of the disease that Trousseau has given the name of *epileptiform neuralgia*. He styles it the least amenable to treatment, and the most permanent form.

The patient is much reduced by her sufferings, and is anæmic also. She has tried all forms of medication for years, and with only temporary relief, if at all. Two years ago her physician, Dr. Hall, cut away a piece of the gum, alveolus, and superior maxillary bone on the left side. This

gave her ease for three weeks, and no longer. Now the left infra-orbital region is the centre of the pain; but it radiates everywhere on both sides of the face; and even sometimes originates on the right side. An operation was recommended as a final resort. It was, however, felt by the surgeon, and explained to the patient, that there were two discouraging features in the case:—

1st. The epileptiform character of the disease.

2d. Its radiating to, and involving other nerves.

These two features indicated, it was feared, some more profound lesion of, or neuralgic impression on, the nervous centres.

Operation, by Dr. Cheever, Oct. 11th, 1873, under ether. The steps of the operation were identical with those described in Case I. On reaching the spheno-maxillary fossa, a troublesome hemorrhage came on, which was checked with cold, and finally styptics. One month after the operation the wound had closed; and two weeks later the patient was discharged.

At first the pain was quite gone. It slowly recurred, but did not resume its paroxysmal character. Before the patient left the hospital, however, she required opium. Subsequently, according to Trousseau's plan, she was narcotized for several weeks by large doses of opium, taking eighteen grains daily. This large amount did not constipate, or appreciably stupefy her, but kept her easy from all approach to neuralgic pain. Subsequently this was discontinued, and she got into a pretty comfortable state of health.

At the present date, nearly two years after the operation, she replies to a letter of inquiry, whether she was benefited by the operation, as follows: "Only to destroy the pain in the immediate locality of the operation. On the other cheek, temple, and in both lower jaws, it is as bad as ever."

For the relief of neuralgia of the superior maxillary nerve, resection has been largely and boldly practised by Carnochan, and subsequently by other American surgeons. Gross, and other surgeons, differ in opinion as to whether it is always necessary to remove Meckel's ganglion as well as the nerve.

Professor Conner, of Cincinnati, has collected thirteen cases in which the operation was done for neuralgia; in seven the pain is known to have recurred at a period varying from four weeks to sixteen months; of the remaining six, in which a return of the affection has not been reported, the history is known, respectively, for twenty-eight days, two months, fourteen months, several months, several years; and the result of one, at the time of the report, was dubious.

It would thus appear that the number of failures, or cases in which temporary relief alone was afforded, exceeds the cures; while under the latter are included the instances in which the result of the operation has not been fully reported.

The other operations for removing the second, or second and third branches of the fifth pair, which have become classical, are:—

1st. Langenbeck's, which consists in pushing a tenotomy knife into the speno-maxillary fissure, and cutting the superior maxillary nerve just as it enters the infra-orbital canal. A small incision below the orbit now exposes the infra-orbital nerve at its point of emergence, and it is seized, twisted, and pulled out of the infra-orbital canal.

2d. Pancoast's, which uncovers the speno-maxillary fossa, by raising a flap over the ramus of the lower jaw, sawing off the coronoid process, and pushing it up under the zygoma; then, by clearing the head of the external pterygoid muscle from the sheathing of the sphenoid, tying the internal maxillary artery, and clearing away the cellular tissue and fat, both nerves, or their branches, can be extirpated.

Langenbeck's operation is obviously less, and Pancoast's much more, formidable than Carnochan's. Langenbeck's leaves the ganglion untouched; Pancoast's admits of its removal, if thought best.

X. UNUNITED FRACTURES.

Among the 1,046 fractures tabulated in the first report of this hospital, only two cases of non-union occurred: one of the femur, high up, was operated on by wires in the hos-

pital, and eventually cured; the other, of the tibia, left the hospital untreated, of his own accord.

We have been unable to find any record, nor have we any recollection, of any cases of fracture treated in the hospital, since that time, which failed to unite.

Certain patients got firm union in spite of the most disadvantageous circumstances. Particularly was this the case with two strong men, one a sailor, and one a laborer, who had fracture of the shaft of the femur. Each of them had delirium tremens, which passed into a state of chronic mania. It was impossible to keep them still, or to control their apparatus. They undid all bonds, splints, and bandages, even of plaster, and got up on their broken thigh-bones. Finally Smith's anterior splint was found the most useful apparatus, since with this the patient can move about in bed, and even get up, without much disturbance of the suspended limb. Both these patients got good results: moderate shortening and firm union. Both walked out of the hospital in as good condition as those who had submitted tranquilly to classical treatment.

The infrequency of non-union, and these cases of union in spite of all obstacles, go to prove that the repair of fracture depends more on the health, vigor, and constitution of the patient than on any special form of apparatus; and that cases of non-union usually occur in consequence of a vice of constitution, and not of various or imperfect treatment.

The insuperable tendency of nature to mend breaks is well shown in the numerous fractures of rachitis and mollities, which join as soon as broken. Even in the wasting atrophy (usually consequent on injury) which ends in *spontaneous* fracture, nature is roused to a supreme effort, throws out callus, and repairs the broken bone.*

Three cases of ununited fracture presented themselves at the hospital for treatment. They were all fractures of both bones of the fore-arm. The broken ends were drawn inwards and out of line by the action of the muscles, and were

* See case of Spontaneous Fracture, by D. W. Cheever, published by D. Clapp & Son, Boston, 1871.

joined only by a loose, ligamentous, flail-like union. They were all operated on by turning out the broken ends, saving the periosteum, but squaring the pointed extremities, and apposing them with silver wires, drilled through the bones. They all got union.

XI. THE ABUSE OF CAUSTICS.

This was well illustrated in the case of a woman of middle age, who came to the hospital with her whole side occupied by an enormous granulating sore, looking like a burn. The breast was gone, together with much of the subjacent tissue, the pectoral muscles, the serratus, and the intercostals; parts of two ribs were gone, and a third rib, separated at one end from its cartilage, was in process of exfoliation, and could be lifted out from the body and snapped like a loose hoop on a barrel. This also came away after a few weeks. The patient stated that she had been treated for "cancer of the breast" (a hard tumor, occupying only a portion of that organ), by caustics applied by a woman. The granulating surface was the costal pleura. The lung was not impaired. There was no sign of cancer proliferation in the wound; and in proof of its absence, and of this fearful sore being due to caustics, and not to cancerous ulceration, is the observed fact, that it kindly cicatrized and healed over with simple treatment. In melancholy confirmation of the justice of the diagnosis as to the original disease, a mass of enlarged and tuberosc glands appeared in the axilla as soon as the wound healed; thus proving, also, that the most thorough, deep, and even dangerous destruction of cancer and its environs by caustics is no protection against, and does not delay, recurrence of the original disease.

XII. STRANGULATED HERNIA.

From June 1st, 1869, to June 1st, 1874, there were eight cases of strangulated hernia treated by herniotomy. In all these cases the symptoms were acute: pain, vomiting, constipation. The duration of symptoms before operation was,

in four cases, less than twenty-four hours; in two cases, two days; in one case, three days; in one case, five days.

The sac was opened in every case. It contained bowel in every case but one; that was omental. In six cases, a portion of small intestine was strangulated; in one case, large intestine. Three cases were femoral herniæ; three were oblique inguinal; two are recorded as scrotal.

Every case but one recovered. The ratio of mortality was $12\frac{1}{2}$ per cent. The fatal case had been strangulated five days; it was femoral, in a feeble woman, with an intermittent pulse. Death occurred in four days.

The average period of convalescence was four weeks.

The unusually small mortality in this series was due to the fact that one-half of the cases had been strangulated less than twenty-four hours.

On the other hand, in the first volume of these reports we have ten cases and seven deaths; or a mortality of 70 per cent. In this series we find one case strangulated during three days; two during four days; two during six days. Every one of these died.

Moderate taxis; brief delay; early operation, — these will always give a small mortality in strangulated hernia.

One case of hernia, not strangulated, nor even inflamed, but irreducible, was operated on by herniotomy, at the patient's request. Grave doubts were felt as to the propriety of opening the sac and trying to replace an irreducible hernia where no acute symptoms were present. The patient was a young, strong man. The hernia was a large scrotal one, and had not been returned for three years. Although the man wore a suspensory-truss, the rupture dragged, increased, and rendered him incapable of getting his living. He was very urgent for an operation. The scrotum and sac having been laid open, a large mass of omentum was found. It had, however, been previously noticed that when he became etherized a portion of the hernia, at the top of the sac, could be pushed back into the abdomen. This was probably intestine. The omental mass was very adherent. It was dissected up, ligatured close to the ring and excised. The stump

granulated and plugged the opening, and the patient recovered perfectly in eight weeks.

Wood's operation for the radical cure of hernia was done eight times. Five are reported as being well, on leaving the hospital; two relapsed, to my knowledge; one was tied with carbolized catgut, passed around the pillars subcutaneously, cut short, and left in. Moderate effusion of lymph followed; no abscess; speedy absorption of the catgut occurred, and the ring was left patent. We are inclined to believe that absorption, and not assimilation, as is claimed, is the fate of all carbolized animal ligatures.

In the radical operation for hernia, patients are lost sight of and cures are claimed. We are knowing to many relapses. Up to this date we have personal knowledge of *five* permanent and positive cures of rupture, — two children and three adults. The last case we have just seen; we operated eight years ago, the patient being then 16 years old; he is perfectly well, and has worn no truss for several years.

CASES WITH AUTOPSIES.

BY W. P. BOLLES, M. D., PATHOLOGIST.

For the records of the following cases while in the wards of the hospital, the writer is indebted to the several gentlemen in whose care they occurred, who have courteously allowed him to copy from the medical and surgical volumes whatever seemed important in relation to them. The autopsies which follow are taken from the autopsy records of the hospital, and, like the clinical histories, are so abridged as to leave out most of the irrelevant matter while retaining all which is of interest in explaining the symptoms and death. They are not offered as all the instructive cases which were brought to the post-mortem room, nor even in some respects as the most instructive of them; the intention being not to take any which have already been adequately reported in medical journals, or any which could be used in the other papers of the present volume, but only such of those remaining as from their clinical interest seemed worthy of a more accessible place than the unpublished records of the hospital could furnish. They are usually simple in their nature and easily understood, and not so rare as to require special comment or introduction.

I. POISONING BY OIL OF CEDAR; INSTRUMENTAL ABORTION.

Mary H., aged 19, single, was brought to the hospital at about one o'clock P. M., having taken the poison four or five hours before. A note from a physician accompanied her, which stated that the amount of the oil taken was one ounce, and that mustard had been given; but did not men-

tion whether vomiting had taken place, nor any facts regarding the abortion. She was at the time of entrance insensible and almost pulseless, groaning with every breath, rigid and somewhat convulsed, with twitching of the eyeballs, and a strong odor of "oil of cedar" in the breath. An emetic of sulphate of zinc and ipecacuanha was given and repeated without effect, when the stomach was emptied and washed out with the pump. Its contents smelled strongly of the poison; so also did some urine drawn with the catheter. Brandy by the rectum was rejected, but it was retained, as well as milk and carbonate of ammonia, when given by the stomach-pump, and produced a temporary effect upon the pulse. Heaters were applied to the body and extremities.

At five o'clock the body had become warm, and the patient was groaning as if in severe pain. Morphia and sinapisms seemed to give relief. She retched, but did not vomit. She would not answer questions, and did not appear to be conscious. During the night she was very restless; the respirations became very frequent, the pulse failed, the skin became livid, and she died the next morning, about twenty-six hours after taking the oil.*

Autopsy.—Body in good condition, well nourished; rigor mortis present. There was a small cut upon the nose, leading to fracture of the nasal bones. The brain and its membranes were congested. The heart was normal. Both lungs had old cicatrices and small cretaceous nodules at their apices, which were adherent to the chest-wall; but there was no recent disease in either, excepting that they were slightly œdematous. The bronchi were deeply injected, and contained a considerable quantity of blood-tinged, frothy fluid. There were several small ulcerations upon each side of the upper portion of the œsophagus, grouped four or five together, from one-twentieth to one-sixth of an inch long, extending through the mucous membrane and raised at the borders (caused by the stomach-pump?). The lower two inches of the œsophagus were considerably reddened. Upon

* Medical Records, Vol. XCII., p. 33.

opening the abdomen, a terebinthinous odor was plainly perceptible. The stomach contained a brownish fluid, of no peculiar odor; the mucous membrane was slightly reddened in several small spots, otherwise it was natural. The intestine was normal, but its contents in the lower end of the ileum and in the colon were grayish, with an oily lustre and strong odor of the cedar oil. The liver was dark. The spleen was normal. The medullary portions of the kidneys were very dark, contrasting strongly with the cortical layers in color. The uterus was about two and a half inches in diameter, and had a foetal membrane about as large as a hen's egg hanging from it. This membrane was ruptured transversely, and in addition had a puncture in it about as large as a pencil. A clot attached the ovum to the womb, and filled the cavity of the latter. No cord or foetus could be found. The right ovary contained a corpus luteum three-fourths of an inch in diameter.

The puncture in the ovum showed that other means were used to procure abortion besides taking the oil.

II. PHOSPHORUS POISONING.

John C., laborer, aged 23, being depressed on account of domestic trouble, at 9 A. M., took, in a glass of beer, a box of "rat powder," said by the apothecary to contain arsenic, but "smelling like matches." At 5 P. M. he began to have pain in the epigastrium and persistent vomiting. At 1 A. M. (eight hours later) he was brought to the hospital by a police officer. When he first arrived, he did not seem to be suffering severely, and walked about the room complaining of pain in the stomach and of thirst. Mustard was given, followed by warm water. These acted freely, and he was then put to bed with a sinapism on the bowels and Epsom salts internally, which latter was followed by free catharsis. At 10 A. M. he was about the same, and took milk and lime-water; ice-bags were applied to the stomach. At 5 P. M. he was more comfortable, but still vomited occasionally.

The next day, at 4.30 A. M., the house officer found him

collapsed and rapidly failing. Emesis was almost constant. Stimulants were given by the rectum, but at 7.30 A. M., forty-six and a half hours from the time of taking the poison, and thirty and one-half after coming to the hospital, he died.

The urine was examined:—

"Color, pale.

"Odor, sweet.

"Reaction, acid.

"Specific gravity, 1026.

"Urea, diminished.

"Earthy phosphates, abundant.

"Alkaline phosphates, none.

"Albumen, 0.5 per cent.

"Sediment, considerable, containing abundant hyaline and a few slightly granular casts, and other casts containing a few fat globules.

"A very decided reaction for phosphorus was obtained."*

Autopsy.—Both lungs adherent. Heart, large, pale, soft, exceedingly fatty, containing considerable clotted blood; its valves were not diseased, but there were several small ecchymoses upon the surface of the auricles. The upper portion of the small intestine was injected upon its peritoneal surface. The stomach contained a considerable amount of bright greenish-yellow, thick fluid, in part egg, and perhaps mustard. In the small intestine was a considerable quantity of more brownish fluid, yet similar to the other. There was no visible change in the mucous membrane of either the stomach or the intestine. The liver was pale, yellow and fatty. The kidneys were pale, fatty, of a slightly yellow tinge, especially at the junction of the cortical and medullary portions. The spleen was normal. There was a slight degree of opacity of the arachnoid all over the convex surface of the brain, and about an ounce of serum lay beneath it. The pia mater was slightly injected. The brain

* Medical Records, XXI., p. 45.

was normal. A microscopic examination of the organs mentioned above confirmed their gross appearance. The contents of the stomach, examined by the hospital apothecary, Mr. Rae, were not found to contain any phosphorus, but that of the upper portion of the small intestine contained a trace, and that of the lower part showed it in a marked degree.

III. SLOUGH OF UTERUS; METASTATIC FOCI IN THE LUNGS.

Sarah G., single, aged 16, was confined, in destitute circumstances, on the 1st of January, the placenta remaining behind five hours until a physician arrived. She had had a good deal of hemorrhage, but did well until the eleventh day, when, upon getting up in a cold room, she became worse, and had pain all over. She had a chill and cough on the twelfth. January 13th she was turned into the street by her father, and afterwards picked up cold and exhausted and brought to the hospital.

She had a chill in the carriage while coming, and another earlier in the morning. She was weak and anæmic, with a slight flush in each cheek, and a slight pain in the womb at times. No headache; lips, pale; tongue, moist; pulse, 160; respirations, 48; temperature, 100°. A few fine râles could be heard in the lower part of the left back; but she was too weak to be examined very thoroughly. The milk had dried away.

Jan. 14th. Did not rest well during the night, and vomited in the morning. No chill.

Jan. 15th. "Complains of severe pain in the right side; is growing worse; the respiration is hurried and labored; the pulse very high and weak; has pain upon pressure in the lower part of the abdomen, and is evidently failing." She died suddenly, fainting, a little after midnight, complaining from the first more of pain in the side and chest than in the abdomen.*

* Medical Records, CIX., p. 214.

Autopsy.—The right lung was completely adherent; near its base was a metastatic abscess larger than a nutmeg, with a distinct irregular wall, containing thick yellowish puriform matter. The lung was solidified around it to the depth of half an inch. The left lung contained in its lower lobe a single hemorrhagic infarction, not broken down, as large as a chestnut; the lungs elsewhere were slightly congested. The spleen was large, pale and soft.

The uterus was six inches long, pale and flaccid, its vessels were large and prominent. It was so thin and soft in front that, in gently turning it backwards, a rupture was made just above the reflection of the peritoneum from the bladder, its anterior wall being scarcely thicker than cardboard. Upon opening it, a slough, one and one-fourth by one and three-fourths inches, was found nearly separated from the anterior wall, leaving almost nothing but the peritoneum beneath it. This was probably the place of attachment of the placenta, and no other could be found; but the slough was of the substance of the uterus. Puriform matter was found in one of the uterine sinuses, and a small abscess near the right ovary.

IV. GENERAL EMPHYSEMA FOLLOWING THORACENTESIS.

Jacob F., aged 25, machinist, of good family history, but somewhat addicted to beer-drinking, had always been well until three months before he entered the hospital (February 18th) with the usual symptoms of phthisis. An examination resulted as follows: The right apex, just below the clavicle, was very dull on percussion, with diminishing dulness below. The right back was also dull, and moist râles and bronchial respiration were heard all over the right side. The respiration was rude on the left side.

No complete examination was recorded after this, but he seems to have gradually failed in strength and appetite; the night-sweats, cough, etc., seem to have continued and increased, and pain to have appeared in the right side.

March 27th. Amphoric respiration could be heard near

the lower angle of the right scapula, with distinct succussion when he was shaken.

April 7th. Three pints of pus were removed from the right pleura with the aspirator, the puncture being made two and a half inches below the scapula; the opening was enlarged, and a sea-tangle tent inserted to keep it from closing. Enormous emphysema followed, and the patient died nine days later.*

Autopsy.—Two days after death. From the opening above described a yellow, very offensive fluid was escaping, having an odor like sulphuretted hydrogen. There was very extensive cellular emphysema, reaching from the insertion of the ears to the pubes and nearly encircling the body. It had distinct borders as follows: Along the lower jaw, which was its upper limit; the spines of the scapulæ, which it reached from the neck and shoulders, and near the median line, from the middle of the sternum down to the pubes. It was nearly symmetrical on both sides. The swelling of the two sides was continuous across the neck and the upper half of the chest. On the back it gradually diminished toward the median line, and was absent at the spine. The anterior mediastinum was also distended with air. There was a large quantity of air and dirty pus in the right pleura, and both its parietal and visceral surfaces were covered with a viscid, yellow exudation, which could be rubbed away, leaving the membrane beneath it hard, white, thickened and creased like grained leather. The right lung was greatly compressed, filled with cheesy masses and suppurating cavities, three of which had ulcerated into the pleura above, and many small ones below.

V. MULTIPLE INJURIES; FRACTURE OF THE SPLEEN; ECCHYMOSES OF THE LUNGS.

Luther R., aged 27, laborer, entered the hospital June 25th. A pile of planks fell on him, producing a com-

* Medical Records, LXXXVIII., p. 182.

pound fracture of both bones of each leg, opening both ankle-joints. There was also a large bruise upon the left thigh, and the patient complained of pains in the chest and epigastrium. Pulse, 90, full and strong. As he declined amputation, which was not urged, because the surgeon suspected internal injury, his legs were placed in fracture-boxes to await the result.

June 26th. Patient rested well during the night; had pain across the upper part of the abdomen during the day. Pulse, 85; tongue, furred.

June 30th. Delirious. Pulse, 135; respiration, 32; temperature, 102°.

He died in collapse, July 2d.*

Autopsy.—Upon the right side the fibula was broken about an inch and a half from its lower extremity; on the left, about four inches from the ankle. Both internal malleoli were broken off; both astragali were roughened, and both tibiæ, as at the time of the injury, could be protruded through rents in the skin over both the outer ankles. The third and fourth right ribs were broken in front, but the fragments did not penetrate the pleura. The sternum was broken across near its middle, and the anterior mediastinum was filled with blood. Both lungs, but especially the left, contained large extravasations of blood; the lower lobe of the left lung was inflamed, and the right contained a number of small local inflammations. The peritoneum contained between one and two pints of clotted blood, which had flowed from ruptures in the spleen; one of these was along its convex surface three inches in length, and a shorter one was at each end, all embedded in clotted blood.

VI. RUPTURE OF AORTIC VALVE.

William H., aged 38, walked into the out-patients' room, March 17th, with a friend, and asked for admission. He was pale and weak, and had a history of pneumonia. He

* Surgical Records, XLVII., p. 115.

was at once sent to the wards, and appeared to be more comfortable after getting to bed, but at one o'clock in the afternoon, as he was sitting up in bed, coughing and raising a little bloody sputum, his pulse became rapid and weak, and the respiration increased to thirty-six. Brandy was given, but in fifteen minutes he was dead.*

Autopsy. — There was a large amount of serum in the pleuræ, and both lungs were œdematous. The heart was greatly dilated and hypertrophied, weighing (with the arch of the aorta) twenty-four ounces; its muscular wall was pale and soft; the mitral valve was slightly diseased, but not enough to embarrass its action. The aortic valves allowed a large stream of water to flow backward by them; one of them was but slightly thickened and roughened; the second considerably so; while the third had growing between it and the second, a large, hard, irregular vegetation, one-third of an inch in diameter, which had become detached, hung backwards into the heart, and had torn away one-third of the valve from its attachment to the aorta. The aorta was very atheromatous, the liver congested, and the spleen large (15 ounces).

VII. SLOUGH OF GASTROCNEMIUS MUSCLE.

Ephraim N. D., aged 52, while at work with his team during a rain-storm, sixteen weeks before entering the hospital, caught cold, and his right leg and foot became inflamed. Sloughs formed upon the back and outer side of the foot, and ulceration followed. He had received no surgical treatment. He was very weak and anæmic. The skin of both legs was pigmented as from old eczematous ulcers. The right foot was enormously swollen, and was at least twice as large as the other; its skin was reddened and thickened. The leg, also, was swollen in its lower half and pitted upon pressure. The inflammation had been extremely severe; several openings had formed upon the

* Medical Records, CXIII., p. 18.

foot, both in the plantar and dorsal surfaces; there was also one in the leg, communicating with a large sphacelus, and exhaling an excessively fetid odor. Nothing but sloughs and strings of aponeuroses could be seen in them.

The patient was allowed stimulants and extra diet, and poultices were applied to the leg.

Three or four days after, several small exploratory incisions were made in the foot, and a small amount of sanious pus was liberated. A portion of the os calcis was found to be denuded, and through the opening over the tendo Achillis, a probe could be passed far upward into the leg. This tendon was utterly destroyed, nothing but a stringy slough remaining to indicate it. The swelling of both leg and foot was increasing, the skin was tense and shining. The poultice was continued, and the leg elevated.

The odor after this became less offensive, but the patient did not improve otherwise. Weakness increased, and sleep became disturbed; then muttering delirium at night, and refusal of food by day supervened, with other signs of exhaustion. The leg continued to swell, and the patient died twenty-two days after his entrance.*

Autopsy. — The foot and leg were greatly swollen. An ulcer upon the sole communicated with an extensive purulent spot among the tendons and ligaments of the tarsus. Two or three inches above the heel, on the back of the leg, was another ulcer about an inch and a half in diameter; out of this hung a slough which lay in a long cavity beneath the deep fascia of the leg, running up nearly to the knee and exposing the soleus muscle. This slough, which was continuous with the two heads of the gastrocnemius muscle, was the only vestige of that muscle below their junction, and was, in fact, its skeleton. The other muscles and tissues around the sinus were infiltrated with inflammatory products, but the gastrocnemius was the only one necrosed. Its nutrient vessels, though sought for, could not be found. The abdominal organs, brain and spinal cord were not diseased, excepting the liver, which was large and fatty.

* Surgical Records, LVI., p. 204.

VIII. EMBOLISM OF THE LEFT VERTEBRAL ARTERY.

Abel C., aged 58, entered the hospital complaining of loss of memory for three or four weeks previous, and a sensation "of something which was sticking in his throat and prevented him from talking." Otherwise, he was feeling perfectly well, and he never had been sick in his life, excepting with small-pox, ten years before. His business required considerable mental labor, and he had applied himself pretty closely to it of late. When first seen he wore an absent-minded expression; he conversed rationally when his attention was fixed, but remembered imperfectly and evidently had trouble in concentrating his thoughts; the appetite was poor, the general functions were normal. Four days after admission difficulty in swallowing appeared, and lasted all day; the milk which he took could be heard "rattling" in his throat, and was then regurgitated. Death, preceded by embarrassed respiration and lividity, occurred suddenly the next day before the house-officer could reach him.*

Autopsy. — Thirty-six hours after death. The heart was of the usual size; the valves of the right side were smooth and perfect, but the aortic and mitral valves were both slightly roughened with fibrinous vegetations; none of these were prominent, however, nor did any of them look as if a portion had been torn away. The arch and descending portion of the aorta were covered over more than one-half of their surface with atheromatous spots, some as large as the thumb-nail, and calcareous or ulcerated; others were smaller and merely thickened. The carotids and other arteries were similarly, but less extensively, degenerated. A firm recent plug of fibrine was found in the left vertebral artery, near its union with the right. It was five-eighths of an inch long, and completely stopped the vessel. There were several atheromatous spots upon the basilar and anterior cerebral arteries. The brain was decomposing. The kidneys were small, degenerated.

* Medical Records, LXXXIX., p. 97.

IX. EMBOLUS OF THE LEFT MIDDLE CEREBRAL.

John A. B., a middle-aged sailor, was admitted to the hospital Oct. 30th, with a note stating that he was taken a week ago, and also that he had had previous similar attacks, from which he had recovered "under the application of a battery," etc. He was strong and well developed, but with complete loss of power in the left arm and leg, and inability to speak, but no paralysis of the face. The tongue could be protruded in a straight line. The sphincter ani was not relaxed. The patient took food well; his bowels were free, his tongue clean.

Nov. 10th. Is able to articulate in a half whisper.

Nov. 24th. Speaks quite clearly. Left arm still powerless, but the leg could be raised even with the bedclothes covering it.

Dec. 26th. Improving; could move left arm also.

Jan. 1st. Patient was seized last evening with convulsions, with foaming at the mouth, followed by coma, stertorous breathing and nictitation. He passed feces involuntarily, and the pulse increased in frequency. Several such attacks followed during the night, and on the next day he died.*

Autopsy.—Heart not enlarged. There was a slight thickening of the mitral valve, but not such as to impair its action. The kidneys were pale, the capsules very slightly adherent. The brain was pink from injection of its vessels, the *punctæ vasculosæ* large, oozing freely. The left middle cerebral artery was occluded by a white solid fibrinous plug, nearly half an inch long, and contained but very little blood above it; one of the branches of the right cerebral was thickened and stiff.

X. RHEUMATISM; VALVULAR LESION: EMBOLISM OF LEFT CAROTID.

William F., aged 23, entered the medical ward with the following history: He had had the typhoid fever

* Medical Records, CVII., p. 130.

ten years ago, but otherwise his general health and his family history were good. Three weeks before entering the hospital, after exposure to cold, he had slight chills, followed by headache, and pains in the right elbow, left shoulder and loins. The elbow had recovered, but the shoulder and back were still painful. There had been a slight cough for a week, and, as he thought, some shortness of breath ever since he was taken sick.

Dec. 17th. His appearance was a little anæmic, his appetite poor, tongue coated, bowels regular, and micturition normal. He complained only of thirst, and of pain in the shoulder and back. Temperature, 101° ; pulse, 108; respiration, 32. A systolic murmur could be heard at the apex, and a double murmur at the base of the heart.

Dec. 19th. Last night, the right arm and left side of the face became paralyzed, and the tongue, upon being protruded, pointed to the left; the patient also had aphasia; although he could understand what was said to him, he could only say "Yes" in reply to every question asked. Next day his whole right side became completely paralyzed, and he died about noon.*

Autopsy. — Fourteen days after death. Body pretty well preserved, frozen. The right pleura contained twenty-four ounces of serum, the left about half as much. Lungs œdematous. The heart was rather large, containing soft clots; at the posterior junction of two of the aortic semi-lunar folds was a large ragged perforation, causing great insufficiency, and shreds of fibrine were loosely attached to its borders. The liver was large and fatty. The spleen was large, weighing a pound and a quarter. A hard, white plug filled the entire cavity of the left carotid artery, beginning in the carotid canal and extending to the junction of the posterior communicating. The middle cerebral artery of this side was fuller of blood than that of the other, and this whole side of the brain was perceptibly injected, and several shades pinker than the other. The brain was soft from decomposition.

* Medical Records, C., p. 3.

XI. EXCEEDINGLY THIN SKULL.

John R. was brought in insensible. He had fallen a number of feet, and had the usual symptoms of fracture of the skull. An extravasation of blood in the lumbar region was the only external indication of injury. There was bleeding from the nose, but not from the ears. Death followed on the same day.*

Autopsy. — Under the effusion of blood in the back the tip of the spinous process of the second lumbar vertebra was broken, but not so as to involve the canal. The only point of interest was the thinness of the skull, which nowhere averaged one-eighth of an inch in thickness. The occipital bone was the thinnest; it was very translucent; in its fossæ it measured only one-fiftieth of an inch, and in its thinnest places was not thicker than writing-paper. The skull was extensively broken and the brain much lacerated.

* Surgical Records, LX., p. 219.

THE SIGNIFICANCE OF PUS IN OVARIAN FLUIDS.

BY JAMES R. CHADWICK, M. D.

This exceptional ingredient of ovarian fluids has been very insufficiently considered by writers upon ovarian tumors, whether from a clinical or a pathological stand-point.

As pus is always the result of inflammation in some form, we should naturally expect that its presence in ovarian fluid would be universally accepted as evidence of this process; yet nowhere do I find this to be the case.

The only indications of cystic inflammation adduced in the clinical histories of ovarian tumors are the symptoms attributable to septic or pyemic fevers; *i. e.*, chills, high pulse and temperature, general malaise, emaciation, etc. Pain seems to be generally absent, unless the peritoneum participates in the inflammatory action. These symptoms are undoubtedly well marked and characteristic in acute inflammation of the cyst-wall, and demand the early removal of the tumor by operation. The ten cases of ovariectomy, recently reported by Keith,* in which the cysts were found to be the seat of acute suppuration, are proofs of the good results which may be expected from operative procedures.

Kiwisch,† Baker Brown,‡ Klob,§ Jos. Kroker,|| J. A.

* On Suppurating Ovarian Cysts. Edinburgh Medical Journal, Feb., 1875.

† Klinische Vorträge, 1852, Abth. II., p. 85.

‡ On Ovarian Dropsy, 1868, p. 12.

§ Pathologische Anatomie des weiblichen Sexualorgane, 1864, pp. 361, 362.

|| Ueber die Ursachen der spontanen Perforation von Ovariencysten. In. Diss., 1869, p. 16.

Baldy,* Peaslee,† Gallez,‡ Barnes,§ Spiegelberg,|| and a few others, make very brief allusions to acute inflammation of ovarian cysts. But none seem to be so conversant with this complication as Mr. Spencer Wells; hence, I offer no apology for quoting from him at some length.

"The ovarian cysts, and more especially the complicated kinds, are liable to become inflamed, either spontaneously or as the consequence of some accident or operation, such as tapping. The disease may run on rapidly with intense symptoms and general peritonitis to a final termination; or it may be more localized, and lead to suppuration in the cavities. This may go on for some time, with the production of pus as in a common abscess; or the contents of the cysts may be converted into any of the foul, disgusting fluids, the result of decomposition. The fatal termination, if the cysts be not removed, may be due to diffuse peritonitis, but more commonly to septic or pyemic fever, the result of blood changes set up by absorption, or by admixture, more or less direct through the vessels of the cyst, of the putrid fluids or gases with the blood. In other cases, ulcerative action in the walls takes place; they then give way, and are perforated."¶

The concluding paragraph of this quotation describes the special condition to which I propose to call attention in this paper. I cannot better introduce the subject than by citing the observation upon which is based the subsequent argument.

* Des accidents de la ponction abdominale des kystes de l'ovaire. Thèse de Paris, 1859, p. 23.

† Ovarian Tumors, 1872, pp. 173, 175.

‡ Histoire des kystes de l'ovaire, 1873, p. 252.

§ Clinical History of the Diseases of Women, 1873, pp. 343, 344, 360.

|| Ueber Perforation der Ovarienkystome in die Bauchhöhle. Archiv für Gynäkologie, 1870, Bd. I., Heft. 1, p. 67.

¶ Diseases of the Ovaries. London, 1872, p. 78.

OVARIAN CYST; ULCERATION OF THE CYST-WALL; PERFORATION WITH FATAL RESULTS.*

February 24, 1874. — Josephine de L., aged 20 years, single, had pain in the right hypochondrium five years ago, which recurred after varying intervals for three years, was absent for a year, but for the past twelve months has been very severe, and has extended to the other side. A swelling appeared in the right hypochondrium nine months ago, and has since gradually extended to the whole abdomen, — the girth now measuring thirty-nine inches. On percussion the abdomen was flat throughout. The only symptoms had been headaches, palpitation, tenderness of the abdomen, and occasional vomiting.

On March 22d the patient was tapped, and twenty-eight pints of a clear, nearly colorless fluid of syrupy consistence drawn from the tumor. On April 24th she was discharged.

On September 5th she re-entered the hospital with the abdomen again distended, and suffering from vomiting and dyspnoea. Two days later ten pints of a clear mucilaginous fluid were drawn with the trocar. On September 10, 1874, she was discharged.

On January 7th, 1876, she reported that the cyst had not begun to refill until February, 1875, when she had a severe fall; since that time she had been tapped, outside of the hospital, four times, at intervals of five, three, three, and two months, respectively, the last having been two and a half months ago. No new symptoms had occurred; the tenderness in the right hypochondrium was very marked.

On January 20th twenty-seven pints of a "*dirty, gray-colored fluid, with a ropy sediment,*" were drawn with the trocar. The fluid (specific gravity 1050) contained albumen, and a small quantity of sugar (?) *pus* and mucus. The patient was discharged on January 22.

* For the notes of this case I am indebted to an abstract from the records of the hospital, by Dr. C. W. Brown, late House Physician, and to a brief synopsis that was published by Dr. Edes (in whose service the case occurred), in the Boston Medical and Surgical Journal for Aug. 17, 1876.

She re-entered on March 6th, and was tapped on the 14th ; twenty-seven pints of a fluid *resembling pea-soup* were removed. On March 16th she was discharged.

On April 18th she entered, with severe pain in the back and right side of the abdomen. Tenderness, on pressure, extended throughout the abdomen. On the next day twenty pints of purulent fluid, the last part of which was thick and flocculent, were drawn with the trocar. She suffered severe cramp-like pains for twenty-four hours, requiring large doses of morphine. On the 22d she was discharged.

On May 24th she re-entered, with the abdomen again fully distended, and quite painful ; pulse, 100 ; temperature, 98.4. On the next day nineteen pints of a milky fluid were removed, the last portion being thick and ropy. There was no pain subsequent to the tapping ; and she was discharged on the 29th of May.

At this operation I was present, by Dr. Edes' request, and tried ineffectually to discover some cause for pus in the fluid. There was no fever or unusual tenderness in the abdomen.

About three weeks later the patient called at my office, at Dr. Edes' suggestion, to make arrangements for ovariectomy at her home. The tumor had then nearly refilled. In consequence of the hot weather to be expected in the month of July, I recommended that she should be again tapped in the hospital, as soon as necessary, and that the operation should be performed at or about August 1st.

On June 28th Miss L. entered the hospital in a state of collapse, with no pulse at the wrist, and vomiting a "coffee-ground" fluid. The tumor was tapped, and much purulent fluid evacuated. She sank during the operation, and died twenty minutes later. It was afterwards learned that she had been taken suddenly with extreme pain and vomiting on the day before entrance.

"The *autopsy* disclosed general peritonitis. On the right side of the median line lay the greater part of a compound ovarian cystic tumor, the largest cyst being adherent to the abdominal walls at the median line, as well as slightly to the omentum. Its walls were from a sixteenth to an eighth

of an inch in thickness, roughened on the inside, and contained a somewhat gelatinous fluid, with much pus. At the upper part, and somewhat to the left, was a small perforation, perhaps one-eighth of an inch in diameter, which corresponded to a reddened, rough, and ulcerated patch upon the inside. It was about four inches above and to the left of the place where the trocar usually entered the cyst. The other cysts were much smaller and filled with clear gelatinous material."

The wall of the main cyst showed several large raised ridges, without any corresponding depressions on the outside; these formed the borders of several quite deep and large pouches, so that they seemed to be the remnants of the walls of former subordinate cysts. Many of the ridges were covered with a pseudo-membrane, beneath which was granulation-tissue, with absence of epithelium; in other words, they were the seat of ulceration. There were many extensive irregular patches of similar character, intersected, and very generally bounded, by slightly raised ridges of firm, white tissue, seemingly cicatricial. In other parts these ridges formed a complicated, radiating net-work, with intervening pouches of healthy cyst-wall. Fully two-thirds of the cyst-wall showed such evidences of present or past ulceration.

Dr. R. H. Fitz has kindly sent me the following description of the microscopic appearances:—

"That portion of the cyst-wall presenting the roughened papillary appearance, and apparently bearing a false membrane, showed an occasional papilla, and a membrane composed of evident agglomerated pus corpuscles. Directly beneath this membrane there was no cylindrical epithelium, though at intervals pouches extended downwards for a short distance, and were lined with cells of such a character.

"The tissue beneath the false membrane occasionally resembled a granulation tissue, the numerous cells being collected about rather large and frequent vessels running vertically towards and nearly to the surface. The smoother,

whiter portions of the wall of the cyst were covered with no epithelium, and were composed of parallel bundles of fibres, separated by broken chains of cells. These parts of the cyst were more fibrous and less cellular than the more deeply seated portions."

It will be noticed in the above history that a "clear, mucilaginous fluid" was obtained from the cyst on Sept. 10th, 1874; that the character of the fluid removed at the fourappings, outside of the hospital, during 1875, is unknown; but that on Jan. 20th, 1876, and at every subsequent tapping, the fluid contained *pus*. Pus was consequently forming in the cyst for at least five months before the patient's death, and perhaps for several months previously.

On the other hand it will be remarked that there were at no time such symptoms of inflammation of the cyst-wall as are indicated, even though briefly, in medical literature. There was no general malaise, no loss of strength or flesh, no fever, no chills; the pulse and temperature were normal on the only occasion when they were recorded.

This discrepancy between the patient's condition and the purulent character of the fluid produced a deep impression upon my mind when I was present at the tapping on May 24th, and led to a long, but futile search for an explanation in the works upon the pathology and clinical features of ovarian tumors.

The fatal result and autopsy have, happily, revealed "the missing link." The formation of the pus is shown to have been due, not to acute inflammation, which might have been recognized, but to a form of chronic inflammation of the lining of the cyst-wall, which may be designated as *ulceration*. This process undoubtedly had its origin in the frequent punctures of the cyst with the trocar, and is the pathological condition to which many authors allude; but which has—so far as I can learn—never been recognized prior to removal of the tumor, or to the death of the patient.

This case, therefore, suggests that pus in the fluid taken

from an ovarian cyst is, in the absence of symptoms pointing to acute inflammation, pathognomonic of ulcerative action in the cyst.

The *perforation* of the cyst-wall, in the course of this process, indicates the imminent danger to which patients are subject, under these circumstances, and calls for quite as prompt operative interference on the part of the surgeon as do the symptoms of acute inflammation.

STATISTICS OF MAJOR AMPUTATIONS.

BY B. F. GORMAN, HOUSE-SURGEON.

The following statistics of the major amputations performed in the Boston City Hospital during the past twelve years, embracing the period from the opening of the hospital in June, 1864, to December 31st, 1876, were compiled and tabulated by Mr. B. F. Gorman, House-Surgeon in 1876. They show very clearly the amount and kind of work done in this department of the hospital service. They also serve to bring into contrast the results in traumatic and in pathological cases.

In the tables of traumatic cases those amputations are described as "primary" which were done within twenty-four hours of the time of the injury ; those are regarded as "secondary" which occurred in the suppuration stage of the lesion. — *Eds.*

II. — AMPUTATIONS AT THE SHOULDER-JOINT. (Traumatic, Secondary.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	RESULT.	COMPLICATIONS.
1.	M.	32	Compound comminuted fracture of arm and fore-arm	19 days . . .	Flaps	Died, 7 hours	Excision elbow primary, followed by gangrene. Shock.
2.	M.	34	" " " "	26 "	Larrey's	Recovered, 59 days .	Intermediate hemorrhage. Suppuration.

Recovered 1. Died 1. Cause of death: Shock.

III. — AMPUTATION AT THE SHOULDER-JOINT. (Pathological.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	RESULT.	COMPLICATIONS.
1.	M.	18	Medullary cancer arm	4 months . .	Larrey's	Recovered, 61 days .	Suppuration. Secondary hemorrhage.

IV. — AMPUTATIONS OF THE ARM. (Traumatic, Primary.)

No.	SEX.	AGE.	NATURE OF INJURY.		DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	34	Compound comminuted fracture of arm		Recent . . .	Flaps . . .	Upper third.	Recovered, 56 days .	Suppuration. Bright's disease.
2.	M.	6	" " " elbow-joint		" . . .	Circular . .	" "	" 75 "	"
3.	M.	30	" " " arm and fore-arm		2 hours . . .	" . . .	Middle third.	" 65 "	" Secondary hemorrhage.
4.	M.	45	" " " fore-arm		Recent . . .	" . . .	Lower third.	" 41 "	"
5.	M.	6	" " " both arms		2 hours . . .	Flaps	Upper third.	Died, 48 hours . . .	Collapse.
6.	M.	49	" " " arm and fore-arm		24 hours . .	Circular . .	" "	" 7 days . . .	"
7.	M.	5	" " " " "		Recent . . .	Flaps	Middle third.	Recovered, 52 days .	Suppuration.
8.	M.	30	" " " " "		3 hours . . .	"	Upper third.	" 54 "	Erysipelas.
9.	M.	27	" " " " "		4 " . . .	Circular . .	" "	" 27 "	Suppuration. Delirium.
10.	M.	31	" " " arm and fore-arm		2 " . . .	" . . .	" "	" 37 "	Delirium tremens. Suppuration.
11.	M.	48	" " " fore-arm		Recent . . .	" . . .	Middle third.	" 35 "	Collapse.
12.	M.	31	" " " " "		" . . .	" . . .	Lower third.	Died, 48 hours . . .	Collapse.
13.	M.	14	" " " " "		" . . .	Flaps	" "	" 20 days . . .	Pneumonia.
14.	M.	47	" " " " "		" . . .	Circular . .	" "	Recovered, 42 days .	Erysipelas.
15.	M.	24	" " " " "		" . . .	" . . .	Middle third.	Died, 24 days . . .	" Diarrhea. Exhaustion.
16.	M.	18	" " " " "		" . . .	" . . .	Upper third.	" 20 " . . .	Pyæmia.
17.	M.	16	" " " " "		" . . .	Flaps	Middle third.	Recovered, 70 days .	Suppuration.

18.	M.	22	"	"	"	"	"	"	"	Upper third.	"	39	"	"
19.	M.	18	"	"	"	"	"	"	"	"	"	25	"	"
20.	M.	19	"	"	"	"	"	"	"	Middle third.	"	31	"	"
21.	M.	40	"	"	arm.	"	"	"	"	Lower third.	Died, 24 days	"	"	Erysipelas. Exhaustion.
22.	M.	43	"	"	"	"	"	"	"	Upper third.	Recovered, 17 days.	"	"	"
23.	M.	29	"	"	"	"	"	"	"	Lower third.	"	71	"	Delirium tremens.
24.	M.	27	"	"	"	"	"	"	"	Upper third.	"	47	"	"
25.	M.	22	"	"	elbow-joint	"	"	"	"	"	"	47	"	Suppuration. Second hemorrhage.
26.	M.	19	"	"	"	"	"	"	"	Lower third.	"	47	"	"
27.	M.	27	"	"	fore-arm	"	"	"	"	Middle third.	"	10	"	"
28.	M.	22	"	"	elbow-joint	"	"	"	"	"	Died, 32 days	"	"	Suppuration. Exhaustion.
29.	M.	40	"	"	fore-arm	"	"	"	"	Lower third.	Recovered, 44 days.	"	"	"
30.	F.	"	"	"	"	"	"	"	"	Upper third.	"	56	"	"
31.	M.	23	"	"	"	"	"	"	"	Middle third.	"	34	"	"

Recovered	23	Cause of death: Exhaustion	3	Amputations in upper third	14 cases; fatal, 3
Died	8	Collapse	3	middle "	" 2
—	—	Pyæmia	1	lower "	" 3
Total	31	Pneumonia	1	—	—
				Total	31
					8

VI. — AMPUTATIONS OF THE ARM. (Pathological.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	58	Necrosis of elbow-joint	1½ years . .	Circular . .	Middle third.	Recovered, 43 days .	Intemperate habits.
2.	M.	27	" " stump	7 months . .	"	Lower third.	" 41 "	
3.	M.	7	" "	9 "	"	"	" 4 "	
4.	M.	50	Necrosis	56 days . . .	"	Upper third.	" 73 "	
5.	F.	15	Caries of elbow-joint	60 "	Flaps	" "	" 43 "	
6.	F.	80	Erysipelas	92 "	Circular . .	Middle third.	" 43 "	
7.	F.	46	Whitlow	60 "	Flaps	" "	" 48 "	
8.	F.	35	Cellulitis	10 "	"	Upper third.	" 29 "	
9.	F.	38	Necrosis of fore-arm	23 weeks . .	"	Middle third.	" 40 "	
10.	M.	30	Abscess of elbow-joint	Chronic . . .	"	" "	" 60 "	

Recovered 10

VII. — AMPUTATIONS AT THE ELBOW-JOINT.

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	N.	28	Compound comminuted fracture of fore-arm	Recent . . .	Circular . .	"	Recovered, 18 days .	
2.	M.	55	Caries of fore-arm	48 days . . .	Flaps	"	" 27 "	

Recovered 2

17. M.	6	"	"	"	"	"	"	Upper third.	"	52	"	
18. M.	76	"	"	"	"	"	"	Middle third.	Died, 2 days	...	Shock.	
19. M.	18	"	"	"	"	"	"	"	Recovered, 23 days	...		
Recovered	...	18	Cause of death: Shock									
Died	...	1	Amputations in upper third									
			middle "									9 cases.
			lower third									4 " fatal, 1
Total	...	19	Total									6 "
												19

IX.—AMPUTATIONS OF THE FORE-ARM. (Traumatic, Secondary.)

NO.	AGE.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M. 23	Compound comminuted fracture of fore-arm	27 days	Flaps	Lower third.	Recovered, 23 days	Slough of flaps.
2.	M. 30	Colles's fracture	28 "	"	Upper third.	Died, 19 days	Pyæmia.
3.	M. 12	Compound fracture of fore-arm.	22 "	"	Lower third.	Recovered, 9 days	
4.	M. 34	"	34 "	"	Upper third.	" 29 "	
5.	M. 35	Incised wound of wrist	35 "	"	Lower third.	Died, 34 days	{ Suppuration. Secondary hemorrhage. Pyæmia.
6.	M. 40	Compound fracture of fore-arm	18 "	"	Middle third.	Recovered, 43 days	
Recovered	...	4	Cause of death: Pyæmia				
Died	...	2	Amputations in upper third				2 cases; fatal, 1
			middle "				1 "
			lower "				3 "
Total	...	6	Total				6

X. — AMPUTATIONS OF THE FORE-ARM. (Pathological.)

No.	Sex.	Age.	NATURE OF DISEASE.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	20	Necrosis of wrist	22 days . . .	Flaps . . .	Lower third.	Recovered, 17 days .	
2.	M.	48	"	56 " . . .	" . . .	Middle third.	Died, 42 days . . .	{ Suppuration. Secondary hemor- rhage. Exhaustion.
3.	M.	23	"	8 months . .	" . . .	" . . .	" 19 " . . .	Pyæmia.
4.	M.	51	"	4 " . . .	" . . .	" . . .	Recovered, 31 days .	
5.	F.	68	Caries of wrist	4 years . . .	" . . .	Lower third.	" 38 " .	{ Intermediate hemorrhage. Ery- sipelas.
6.	M.	35	Palmar abscess	Old	" . . .	" . . .	" 23 " .	Suppuration.
7.	F.	54	Epithelioma of hand	1 year . . .	" . . .	Middle third.	" 36 " .	
8.	F.	39	Traumatic erysipelas	27 days . . .	" . . .	" . . .	" 29 " .	
9.	F.	"	Caries of hand	"	Circular . .	Lower third.	" 25 " .	
10.	F.	60	Cancer of hand	1 year . . .	Flaps . . .	" . . .	" 31 " .	
11.	M.	36	Caries of wrist	1 " . . .	" . . .	" . . .	" 43 " .	
12.	M.	31	Pulpy degeneration of wrist	2 years . . .	" . . .	Middle third.	" 34 " .	Erysipelas.

Recovered 10
 Died 2
 Total 12

Cause of death: Exhaustion 1
 Pyæmia 1

Amputations in middle third 6 (2 fatal.)
 lower third 6

XI. — AMPUTATIONS AT THE HIP-JOINT. (Traumatic, Primary.)

No.	Sex.	Age.	Nature of Disease.	Duration.	Method.	Result.	Complications.
1.	M.	8	Compound comminuted fracture of thigh	Recent . . .	Flaps . . .	Died, 27 hours . . .	Shock.
2.	M.	3	" "	" "	" "	" 48 " . . .	Convulsions.
3.	M.	25	" "	" "	" "	" 2 " . . .	Shock. Fracture of skull.

Cause of death: Shock 2; Convulsions 1.

XII. — AMPUTATIONS OF THE THIGH. (Traumatic, Primary.)

No.	Sex.	Age.	Nature of Disease.	Duration.	Method.	Place.	Result.	Complications.
1.	M.	23	Compound comminuted fracture of thigh	Recent . . .	Flaps . . .	Lower third.	Recovered, 144 days.	Suppuration. Delirium.
2.	M.	27	" " thigh and leg . .	1½ hours . .	Circular . .	" "	" " 1 year. .	{ Leg amputated. Intermed. hemor- { rhage. Delirium, Suppuration.
3.	M.	26	" " thigh	3¼ " . . .	" " . . .	" "	Died, 23 days	{ Slough of flaps. Erysipelas. De- { lirium.
4.	M.	70	" " "	2 " . . .	" " . . .	Middle third.	" " 4½ hours . . .	Shock.
5.	M.	10	" " "	2½ " . . .	" " . . .	" "	" " 33 " . . .	{ Convulsions. Simple fracture of { fore-arm and opposite thigh.
6.	M.	16	" " "	4 " . . .	Flaps . . .	Lower third.	" " 1 " . . .	Shock.
7.	F.	23	" " "	Recent . . .	" " . . .	Upper third.	" " 6 days	{ Suppuration. Dysentery. Vomit- { ing. Delirium. Exhaustion.
8.	M.	29	" " "	" " . . .	" " . . .	Lower third.	Recovered, 34 days .	Suppuration.
9.	M.	39	" " "	" " . . .	" " . . .	" "	Died, 20 days	{ Intermediate hemorrhage. Sup- { puration. Pyæmia.

XII.—AMPUTATIONS OF THE THIGH. (Traumatic, Primary.) — Continued.

No.	Sex.	Age.	NATURE OF DISEASE.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
10.	M.	21	Compound comminuted fracture of thigh	Recent . . .	Flaps . . .	Lower third.	Died, 2 days	Intermediate hemorrhage. Shock.
11.	M.	14	" " leg	"	Circular . .	" "	" 27 "	Suppuration. Pyæmia.
12.	M.	37	" " thigh	8 hours . . .	"	Upper third.	" 37 hours	Collapse.
13.	M.	9	" " "	2 "	"	" "	" 8 "	Shock.
14.	M.	47	" " leg	16 "	"	Lower third.	" 3 days	Collapse.
15.	M.	25	" " thigh	1 "	"	Upper third.	Recovered, 73 days .	{ Suppuration. Diarrhoea. Exhaustion.
16.	M.	63	" " leg	Recent . . .	"	Lower third.	Died, 48 hours . . .	Collapse.
17.	M.	35	" " thigh and leg	2 hours . . .	"	" "	" 34 days	Collapse.
18.	M.	6	" " leg	Recent . . .	"	" "	Recovered, 16 days .	Collapse.
19.	M.	57	" " "	"	"	Middle third.	Died, 4 days	Collapse.
20.	M.	33	" " knee joint	"	Flaps . . .	" "	" 2 "	Suppuration. Delirium. Collapse.
21.	F.	56	" " thigh	"	"	" "	Recovered, 81 days .	Intermed. hemorrhage. Erysipelas.
22.	M.	58	" " "	"	"	Upper third.	Died, 1½ hours . . .	{ Shock. Fractured rib, lower jaw and skull.
23.	F.	7	" " leg	2 hours . . .	"	Middle third.	" 10 "	Shock.
24.	M.	15	" " thigh	Recent . . .	"	" "	Recovered, 91 days .	Suppuration.
25.	M.	25	" " "	3 hours . . .	"	Lower third.	" 32 "	
26.	M.	..	" " "	3 "	"	Upper third.	Died, 4 hours	Shock.
27.	M.	34	" " thigh and arm	Recent . . .	"	Middle third.	" 5 "	{ Shock. Arm amputated in middle third.
28.	M.	63	" " thigh	"	"	Lower third.	" 2 days	Collapse.
29.	M.	65	" " knee	"	"	" "	" 4 "	Collapse.

XIII. — AMPUTATIONS OF THE THIGH. (Traumatic, Secondary.)

No.	Sex.	AGE.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	F.	47	Compound comminuted fracture of leg	108 days . .	Flaps	Lower third.	Recovered, 201 days.	{ Suppuration. Secondary hemorrhage. Gangrene. Pyæmia.
2.	M.	25	" " " " " " " " " " " "	7 " " " " " " " " " " " "	Circular . .	" "	" 136 "	Gangrene. Pyæmia.
3.	M.	35	" " " " " " " " " " " "	69 " " " " " " " " " " " "	" "	" "	Died, 10 days	{ Suppuration. Erysipelas. Diarrhea. Exhaustion.
4.	M.	27	" " " " " " " " " " " "	3 " " " " " " " " " " " "	" "	" "	Recovered, 69 days .	Intermediate hemorrhage.
5.	F.	58	Simple fracture of thigh	71 " " " " " " " " " " " "	" "	Middle third.	Died, 11 days	Pyæmia.
6.	M.	48	Compound comminuted fracture of leg	34 " " " " " " " " " " " "	" "	" "	" 11 " " " " " "	Pyæmia.
7.	M.	34	Inclosed wound of knee-joint	14 " " " " " " " " " " " "	" "	" "	Recovered, 63 days .	Diarrhoea.
8.	M.	21	Compound fracture of thigh	27 " " " " " " " " " " " "	Flaps	Upper third.	Died, 43 days	Pyæmia. Bright's disease.
9.	M.	16	Stab in groin. External iliac tied	30 " " " " " " " " " " " "	" "	Lower third.	Recovered, 78 days .	Gangrene.
10.	M.	30	Compound fracture of leg	104 " " " " " " " " " " " "	" "	Middle third.	Died, 22 days	{ Exhaustion. Dislocation of hip. Reduced.
11.	M.	6	Compound comminuted fracture of leg	21 " " " " " " " " " " " "	Circular . .	Lower third.	Recovered, 96 days .	
12.	M.	39	" " " " " " " " " " " "	13 " " " " " " " " " " " "	Flaps	Middle third.	Died, 18 days	Pyæmia.
13.	F.	37	Compound fracture of leg	10 " " " " " " " " " " " "	" "	Upper third.	Recovered, 101 days.	

Recovered	7	Cause of death: Pyæmia	4	Amputations in upper third	1
Died	6	Exhaustion	2	middle " " " " " " " " " " " "	5
Total	13	Total	6	lower " " " " " " " " " " " "	1
				Total	13
					6

XIV.—AMPUTATIONS OF THE THIGH. (Pathological.)

No.	Sex.	Age.	Nature of Injury.	Duration.	Method.	Place.	Result.	Complications.
1.	M.	25	Chronic disease of knee-joint	4 years . .	Flaps	Lower third.	Recovered, 106 days.	{ Joint first excised. Hemorrhage from bone.
2.	F.	34	Chronic arthritis	2½ " . .	"	" "	" 73 "	Suppuration.
3.	M.	21	Neuroma	11½ months .	Circular . .	Upper third.	" 56 "	{ Suppuration. Secondary hemorrhage.
4.	M.	11	Scrofulous disease, knee and ankle	4 years . .	"	Lower third.	" 56 "	Shock.
5.	M.	28	Necrosis	2 " . .	"	Middle third.	Died, 6 hours	
6.	F.	5	Disease of knee-joint	3 months .	"	" "	Recovered, 23 days .	
7.	M.	19	White swelling	1 year . .	Flaps	" "	Died, 101 days . . .	{ Post mortem. Tuberculosis. Fatty liver. Ulceration of intestines.
8.	M.	21	Necrosis of tibia	13 " . .	"	Lower third.	Recovered, 57 days .	Intermediate hemorrhage.
9.	M.	17	Necrosis of femur	29 days . .	"	Upper third.	" 44 "	Suppuration. Delirium.
10.	M.	21	Scrofulous disease, knee-joint	3 years . .	"	Lower third.	Died, 37 days	{ Suppuration. Diarrhea. Exhaustion.
11.	M.	16	" "	6 " . .	"	" "	Recovered, 55 days .	Intermediate hemorrhage. Suppuration.
12.	M.	22	Necrosis of stump (leg)	10 months .	"	" "	Died, 34 days	Suppuration. Secondary hemorrhage.
13.	M.	29	Necrosis of femur	128 days . .	"	Upper third.	" 11 "	{ Primary hemorrhage. Slough of flaps. Exhaustion.
14.	M.	21	Necrosis of stump (leg)	3½ years . .	Circular . .	Middle third.	Recovered, 42 days .	
15.	M.	25	Scrofulous disease, knee	1½ " . .	"	" "	" 80 "	
16.	M.	43	Disease of knee-joint	18 months .	"	" "	Died, 5 days	Collapse.
17.	M.	43	Chronic ulcer of leg	13 years . .	Flaps	Lower third.	Recovered, 53 days .	
18.	F.	22	Disease of knee-joint	16 " . .	Circular . .	" "	" 62 "	

XIV.—AMPUTATIONS OF THE THIGH. (Pathological.)—*Continued.*

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
19.	M.	27	Gangrene of foot	25 days . . .	Circular . .	Middle third.	Died, 14 days . . .	Suppuration. Exhaustion.
20.	M.	38	Chronic disease, knee-joint	1 year . . .	" . .	Lower third.	" 9 " . . .	Suppuration. Exhaustion.
21.	M.	50	" "	5 " . . .	Flaps . . .	Middle third.	Recovered, 81 days.	{ Intermediate hemorrhage. Erysipelas.
22.	M.	60	Necrosis of tibia	30 " . . .	Circular . .	" "	" 106 "	"
23.	M.	59	" "	13 " . . .	" . .	Upper third.	" 106 "	"
24.	F.	35	Synovitis of knee	21 weeks . .	Flaps . . .	Middle third.	" 155 "	"
25.	M.	22	Chronic disease of knee-joint	10 years . .	Circular . .	Lower third.	" 40 "	"
26.	M.	25	Necrosis of femur		" . .	Upper third.	" 43 "	"

Recovered, 18; died, 8; total, 26. Cause of death: Shock, 1; Tuberculosis, 1; Collapse, 1; Exhaustion, 5; total, 8. Amputations in upper third, 5—1 fatal; in middle third, 10—4 fatal; in lower third, 11—3 fatal; total, 26; total fatal, 8.

XV.—AMPUTATIONS AT THE KNEE-JOINT. (Traumatic, Primary.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	30	Compound comminuted fracture of leg	4 hours . . .	Condyles removed }	Joint	Recovered, 114 days.	Suppuration. Erysipelas.
2.	M.	30	" "	Recent . . .		"	Re-amputated, 22 dys	{ Recovered, 39 days. Secondary hemorrhage.
3.	M.	26	" "	"		"	" "	{ Fore-arm amputated. Recovered, 207 days.
4.	M.	7	" "	"		"	" 15 dys	Removed. Died of Pyæmia.
5.	M.	67	" "	"		"	Dead, 6 days	Suppuration. Exhaustion.

Recovered 3; died 2; total 5. Cause of death: Pyæmia 1; Exhaustion 1.

XVI.—AMPUTATIONS AT THE KNEE-JOINT. (Traumatic, Secondary.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	55	Simple fracture of leg	19 days . . .	Joint	Died, 19 days	Intemperate habits. Slough of flaps. Exhaustion.
2.	F.	40	Compound fracture into ankle-joint	" "	" "	" 10 "	" " " "

Died 2. Cause of death: Exhaustion 2.

XVII.—AMPUTATION AT THE KNEE-JOINT. (Pathological.)

No.	Sex.	Age.	NATURE OF INJURY.	RESULT.	COMPLICATIONS.
1.	M.	6	Chronic disease of knee-joint	Recovered, 31 days	

Recovered 1

XVIII. — AMPUTATIONS OF THE LEG. (Traumatic, Primary.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	11	Compound dislocation of ankle	1 hour . . .	Circular . .	Upper third.	Recovered, 54 days .	Intemperate habits. Delirium.
2.	M.	..	" fracture of leg	3 hours . . .	"	"	" 93 "	
3.	M.	40	Laceration of foot	1½ " . . .	Flaps	" "	" 179 "	Suppuration.
4.	M.	48	Compound comminuted fracture of leg	Recent . . .	"	Middle third.	" 141 "	Gangrene of flaps. Delirium.
5.	M.	52	" " " both legs	5 hours . . .	"	Upper third.	Died, 6 hours . . .	Shock. Both legs amputated.
6.	M.	45	" " " leg	Recent . . .	"	Middle third.	" 4 " . . .	{ Scalp wound. Compound fracture frontal bone. Symptoms of com- pression of brain.
7.	M.	47	" " " "	"	N. Smith . .	Lower third.	Recovered, 279 days .	Suppuration. Delirium tremens.
8.	M.	4	" " " foot	"	"	Middle third.	" 66 " . . .	Suppuration. Varicella.
9.	M.	34	" " " leg	"	Flaps	Upper third.	Died, 4 hours . . .	Primary hemorrhage. Shock.
10.	F.	..	" " " "	"	"	Lower third.	Recovered, 62 days .	" " Delirium tremens.
11.	M.	53	" " " ankle	2 hours . . .	"	Upper third.	Died, 5 hours . . .	Shock.
12.	M.	23	" " " "	2 hours . . .	"	Middle third.	Recovered, 67 days .	Intermediate hemorrhage.
13.	..	..	" " " leg	Recent . . .	"	Upper third.	Died, 24 hours . . .	Shock.
14.	M.	21	" " " "	2 hours . . .	"	" "	Recovered, 40 days .	Suppuration.
15.	M.	7	" " " foot	Recent . . .	Circular . .	Lower third.	" 38 " . . .	Suppuration.
16.	M.	25	" " " leg	4½ hours . .	"	Upper third.	Died, 8 hours . . .	Intoxicated. Shock.
17.	M.	81	" " " "	Recent . . .	Flaps	Lower third.	Recovered, 30 days .	
18.	M.	..	Incised wound	"	"	Middle third.	Died, 29 days . . .	{ Gangrene. Delirium. Diarrhœa. Exhaustion.

[illegible]

XIX. — AMPUTATIONS OF THE LEG. (Traumatic, Secondary.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	30	Compound comminuted fracture of foot.	12 days. . .	Circular . .	Lower third.	Recovered, 226 days.	Suppuration.
2.	M.	69	" " leg	19 " . . .	Flaps	Middle third.	" 159 " .	Slough of flaps.
3.	M.	43	" " "	72 " . . .	"	Lower third.	" 81 " .	Suppuration.
4.	M.	46	Simple fracture of leg	24 " . . .	"	Middle third.	" 55 " .	Suppuration. Delirium tremens.
5.	F.	20	Compound dislocation of ankle	15 " . . .	"	Upper third.	Died, 9 days . . .	Pyæmia.
6.	M.	36	" comminuted dislocation of ankle	27 " . . .	"	Lower third.	" 40 " . . .	Suppuration. Pyæmia.
7.	M.	31	" fracture of foot	27 " . . .	"	Middle third.	Not recorded . . .	
8.	M.	25	" comminuted fracture of leg	5 " . . .	"	"	Recovered, 125 days.	Suppuration.
9.	M.	11	" " "	40 " . . .	Circular . .	Upper third.	" 39 " .	"
10.	M.	30	Simple fracture of leg	20 " . . .	Flaps	"	Died, 9 days . . .	{ Intermediate hemorrhage. Gangrene. Exhaustion.
11.	M.	7	Slough of flaps	15 " . . .	"	Lower third.	Rem'd by friends, 4 d.	
12.	M.	9	Compound comminuted fracture of foot	22 " . . .	Teale's flaps.	"	Died, 140 days . . .	{ Slough. Secondary hemorrhage. Re-amputation. Exhaustion.
13.	M.	24	" " "	53 " . . .	Flaps	Middle third.	Recovered	
14.	M.	20	" " leg	28 " . . .	"	Upper third.	"	

Recovered 8
Died 4
Removed 2
Total 14

Cause of death: Pyæmia 2
Exhaustion 2

Amputations in upper third 4 cases; fatal, 2
middle " 5 " 0
lower " 5 " 2
Total 14 4

XX. — AMPUTATIONS OF THE LEG. (Pathological.)

No.	Sex.	Age.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
1.	M.	38	Irritable stump	2 years . . .	Flaps	Upper third.	Recovered, 179 days .	Suppuration.
2.	M.	45	Necrosis of ankle	8 "	"	Middle third.	Died, 141 days . . .	Gangrene. Delirium. Exhaustion.
3.	M.	31	Frost-bite	20 days . . .	"	Lower third.	Recovered, 48 days .	Slough of flaps.
4.	M.	30	Necrosis of stump	2 years . . .	"	Upper third.	" 34 " .	Gangrene.
5.	M.	35	Necrosis of ankle	8 months . .	"	Middle third.	" 37 " .	Intermed. hemorrhage. Suppurat'n.
6.	M.	47	Ulceration of stump	"	"	" " .	" 79 " .	Suppuration. Second'y hemorrhage.
7.	M.	37	Ulcer of leg	7 months . .	"	" " .	" 30 " .	"
8.	M.	23	" stump	1 "	"	" " .	" 38 " .	Suppuration.
9.	M.	35	" "	2 years . . .	"	Upper third.	" 104 " .	Suppuration. Second'y hemorrhage.
10.	M.	26	Caries of ankle	3 months . .	"	Lower third.	" 79 " .	Tuberculosis. Suppuration.
11.	M.	24	Ulceration and painful stump	18 "	"	Upper third.	" 56 " .	Suppuration.
12.	M.	50	Epithelioma of ankle	"	Circular . .	Lower third.	" 105 " .	Suppuration.
13.	M.	56	Neuralgia of stump	"	Flaps	Upper third.	" 47 " .	Delirium.
14.	M.	72	Senile gangrene	4 months . .	"	Middle third.	Died, 15 days	Diarrhea. Delirium. Exhaustion.
15.	M.	35	Necrosis of ankle	"	Circular . .	Upper third.	Recovered, 27 days .	"
16.	M.	26	Irritable stump	"	"	" " .	Died, 17 days	Pyæmia.
17.	M.	46	Caries of ankle	9 months . .	"	Middle third.	" 15 "	"

XX. — AMPUTATIONS OF THE LEG. (Pathological.) — *Continued.*

No.	Age.	Sex.	NATURE OF INJURY.	DURATION.	METHOD.	PLACE.	RESULT.	COMPLICATIONS.
18.	M.	34	Necrosis of foot		Circular . .	Middle third.	Died, 14 days . . .	Pyæmia.
19.	M.	39	Caries of ankle	4 years . . .	" . .	Lower third.	Recovered, 221 days.	Suppuration.
20.	F.	9	"		" . .	Middle third.	" 50 "	
21.	F.	30	"	3 months . .	" . .	" "	" 63 "	
22.	M.	40	Irritable stump	3 " . .	Flaps	" "	" 52 "	
23.	F.	22	Caries of ankle	6 " . .	"	Lower third.	" 60 "	
24.	M.	54	Ulceration of foot		"	" "	Died, 16 days . . .	Slough of flaps. Tetanus.
25.	M.	71	Caries of tibia	10 years . .	"	Upper third.	Recovered, 42 "	
26.	M.	64	Ulceration of leg	36 " . .	"	" "	Died, 50 days . . .	{ Suppuration. Secondary hemorrhage. Popliteal artery ligated.
27.	M.	55	Caries of ankle		"	" "	Recovered, 60 days.	

Recovered	20	Cause of death: Pyæmia	2	Amputations in upper third	10 cases; fatal, 2
Died	7	Exhaustion	4	middle "	" 4
	—	Tetanus	1	lower "	" 1
Total	27		—		
		Total	7	Totals	27
					7

XXI.—AMPUTATIONS AT THE ANKLE-JOINT. (Traumatic, Primary.)

No.	SEX.	AGE.	NATURE OF INJURY.	DURATION.	METHOD.	RESULT.	COMPLICATIONS.
1.	M.	30	Compound comminuted fracture of foot	Recent . . .	Lisfranc's .	Recovered, 50 days .	Intoxicated. Delirium tremens.
2.	F.	17	" " "	"	".	Death, 24 days . . .	Suppurated. Tetanus.
3.	M.	. .	" " "	"	Hey's . . .	Died, 5 days	Delirium tremens.
4.	M.	22	" " "	"	".	Recovered, 98 days .	Erysipelas. Leg re-amputated.
5.	M.	17	" " "	"	Lisfranc's .	" 23 " .	
6.	M.	8	" " "	"	".	" 124 " .	

Recovered 4; died 2; total 6	Cause of death: Tetanus 1; delirium tremens 1
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XXII.—AMPUTATIONS AT THE ANKLE-JOINT. (Traumatic, Secondary.)

No.	SEX.	AGE.	NATURE OF INJURY.	DURATION.	METHOD.	RESULT.	COMPLICATIONS.
1.	M.	43	Compound comminuted fracture of foot	65 days . . .	Lisfranc's .	Recovered, 131 days .	{ Erysipelas. Gangrene. Diarrhea. Secondary hemorrhage. Leg re-amputated.
2.	M.	23	" " " " " " " " " " " " " " " "	4 " . . .	Chopart's .	" 93 " .	Suppuration. Tuberculosis. Leg re-amputated.
3.	M.	27	" " " " " " " " " " " " " " " "	7 " . . .	Chopart's .	" 40 " .	Suppuration.
4.	M.	30	" " " " " " " " " " " " " " " "	27 " . . .	Hey's . . .	" 76 " .	Records incomplete.

Recovered..... 4

XXIII.—AMPUTATIONS AT THE ANKLE-JOINT. (Pathological.)

No.	SEX.	AGE.	NATURE OF INJURY.	DURATION.	METHOD.	RESULT.	COMPLICATIONS.
1.	M.	48	Necrosis of foot.	20 years . .	Hey's . . .	Recovered, 76 days.	Suppuration.
2.	M.	23	Gangrene	26 days . . .	Hey's . . .	Died, 71 days . . .	{ Diarrhoea. Suppuration. Delirium. Exhaustion. Leg re-amputated.
3.	M.	66	Frost-bite	3 weeks . .	Syme's . . .	Recovered, 32 days.	
4.	M.	20	"	1 month . .	Roux's . . .	" 124 " .	Suppuration.

Recovered 3 Died 1
Cause of death: Exhaustion 1

STATISTICS OF 699 MAJOR AMPUTATIONS AT THE MASSACHUSETTS GENERAL HOSPITAL (1822-71).*

PLACE.	TRAUMATIC, PRIMARY.				PLACE.	TRAUMATIC, SECONDARY.				PLACE.	PATHOLOGICAL.			
	RECOVERED.	DIED.	TOTAL.	RATIO OF MORTALITY.		RECOVERED.	DIED.	TOTAL.	RATIO OF MORTALITY.		RECOVERED.	DIED.	TOTAL.	RATIO OF MORTALITY.
Shoulder	7	8	15	53.33						8	3	11	27.27	
Arm	29	7	36	19.44	Arm	5	3	8	37.56		28	4	32	12.50
Fore-arm	22	7	29	24.13	Fore-arm	10	2	12	16.66		23	4	27	14.81
Hip	. . .	1	1	100.						2	. . .	2		
Thigh	34	25	59	42.37	Thigh	6	9	15	60.00		128	34	162	20.98
Knee	2	3	5	60.00						7	4	11	36.36	
Leg	63	33	96	34.37	Leg	34	18	52	34.61		104	15	119	12.60

* Boston Medical and Surgical Journal, Vol. LXXXVI., p. xx of Supplement.

THE MORTALITY OF AMPUTATIONS, DISTRIBUTED ACCORDING TO AGE.

	<i>Cases under 20 years.</i>	<i>Between 20 and 40 years of age.</i>	<i>Over 40 years of age.</i>
Callender	61 cases, 3 died	92 cases, 20 died	74 cases, 30 died.
Holmes	83 " 10 "	" 127 " 35 "	" 90 " 38 "
Total	144 " 13 " or 1 in 11.	219 " 55 " or 1 in 4.	164 " 68 " or 1 2.4.

STATISTICS OF 299 MAJOR AMPUTATIONS AT THE BOSTON CITY HOSPITAL (1864-76).

PLACE.	TRAUMATIC, PRIMARY.				PLACE.	TRAUMATIC, SECONDARY.				PLACE.	PATHOLOGICAL.			
	RECOVERED.	DIED.	TOTAL.	PERCENT. OF MORTALITY.		RECOVERED.	DIED.	TOTAL.	PERCENT. OF MORTALITY.		RECOVERED.	DIED.	TOTAL.	PERCENT. OF MORTALITY.
Shoulder	10	7	17	41.2	Shoulder	1	1	2	50.	Shoulder	1	...	1	...
Arm	23	8	31	25.8	Arm	5	6	11	54.5	Arm	10	...	10	...
Elbow	1	...	1	...		...	...	...	...	Elbow	1	...	1	...
Fore-arm	18	1	19	5.3	Fore-arm	4	2	6	33.3	Fore-arm	10	2	12	16.7
Hip	...	3	3	100.		...	...	...	...		...	...	...	...
Thigh	17	33	50	60.	Thigh	7	6	13	46.2	Thigh	18	8	26	30.8
Knee	3	2	5	40.	Knee	...	2	2	100.	Knee	1	...	1	...
Leg	20	12	32	37.8	Leg	8	4	12	33.3	Leg	20	7	27	25.9
Ankle	4	2	6	33.3	Ankle	4	...	4	...	Ankle	3	1	4	25.

THE MORTALITY OF AMPUTATIONS, DISTRIBUTED ACCORDING TO AGE.

Cases under 20 years.

73 cases, 22 died, or 1 in 3.3.

Between 20 and 40 years of age.

151 cases, 51 died, or 1 in 3.

Over 40 years of age.

75 cases, 34 died, or 1 in 2.2.

Of 299 amputations 107 were fatal, from the following causes: { Shock } 43; Exhaustion 23; Erysipelas 2; Other causes 8.
 { Collapse } 23; Pyæmia 2;

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